

171-6 STATUS OF THE MANDATED SOLID WASTE MANAGEMENT SYSTEM

6-1 INTRODUCTION

The State is developing an integrated system of solid waste management facilities and programs based on priorities of source reduction, source separation and recycling, processing, and land disposal and the requirements of the legislature, DEM, the courts, and economic conditions. This part of the Plan describes this mandated system that includes:

- the Corporation's and DEM's Source Reduction Programs;
- the statewide Municipal, Commercial, State Agency, Multi-family, and Schools Recycling Programs; Recycling Market Development Programs; multiple Composting Programs; and the Corporation's Materials Recovery Facility (MRF); and
- the Corporation's Central Landfill facilities in Johnston.

6-2 SOURCE REDUCTION

6-2-1 Background

Source reduction is recognized in RIGL §23-19-3 (11) as Rhode Island's highest waste management priority. In its broadest sense, source reduction attempts to do more than curb wastefulness; its goal is to conserve natural resources by encouraging sustainable patterns of consumption. Within the narrower perspective of waste management, source reduction strategies are aimed at reducing the environmental and economic costs of managing solid waste by reducing quantity and toxicity. Source reduction attempts to eliminate unnecessary products and packaging. Source reduction activities also lessen the burden placed on other elements of the integrated waste management system by increasing recyclability of some packages and by minimizing toxic components.

Source reduction of waste will require sustained, long-term effort. The roots of the steady trend of increasing waste production are embedded in our economy and culture. Changing the trend will require extensive education to teach consumers and producers less wasteful behavior; significant incentives, disincentives, and regulations may also be necessary to ensure that source reduction strategies are adopted. These efforts are long term in scope and resource-intensive.

a. Funding

Source reduction programs have not received significant funding in comparison to other waste management programs, such as recycling. A principal explanation is that, unlike recycling, source reduction efforts will not extend the capacity of waste-disposal facilities in the short time-frames within which waste managers generally operate. In addition, other benefits, such as removing toxics from the waste stream, are difficult to quantify.

Because source reduction programs do not generally generate revenues, as do some of the other waste management programs, funding for source reduction is dependent on a specific funding mechanism, such as a percentage of tipping fees or a tax on particular products. Another option is the institution of user fees for waste collection and disposal, with a portion of the fee income set aside for source reduction programs. User fees have the added benefit of making citizens more aware of their consumption and disposal habits. Most Rhode Islanders do not pay directly for solid waste disposal, and so give little thought to their disposal habits. Instituting a user-fee system can provide both incentives to consumers to reduce and one source of funding necessary to operate an effective source reduction program.

b. Goal-Setting and Measurement

Rhode Island has not yet established a source reduction goal, although the Source Reduction Task Force has set a policy of not increasing the waste generation rate. In 1987, the Task Force decided that sufficient information was not available to enable it to set a quantifiable goal. Yet goals can help stimulate action to ensure that source reduction realizes its full potential.

However, goals have little meaning without methods to track progress towards meeting them. Developing these measurement strategies is one of government's great challenges in implementing source reduction programs. While measuring the progress of recycling is fairly straightforward--how much material is being collected and marketed?--there are no simple ways of measuring source reduction. Indeed, how can we measure what is not taking place?

Simply tracking the state's waste generation rate will not tell us much about our success in implementing a source reduction program; changes in waste generation may be due to a number of diverse factors, including population, employment, the economy, materials changes by manufacturers, recycling, and waste disposal costs. Further, as the goal of source reduction is to ensure pollution reduction and resource conservation at all stages of a product's life, we cannot be certain that an overall reduction in the weight of the local waste stream is not increasing pollution at other stages of a product's life (e.g., manufacture).

The current inability to resolve measurement issues must not be a justification for inaction. Major reductions can be achieved in both quantity and toxicity of solid waste. Committed individuals, businesses, and institutions have demonstrated reductions in waste beyond their boldest predictions. While everyone may not be inclined to make waste reduction a personal priority, it seems apparent that with proper information and incentive, virtually everyone can adopt simple waste reduction techniques at home, work, and in designing new products.

Some ideas for measuring progress toward a goal do present themselves. The City of Seattle will be tracking the success of its source reduction educational program by surveying consumer attitudes towards adopting specific source reduction behaviors. Seattle has already done a survey to obtain base-line data, and will repeat the survey over time to track the success of its efforts. Measurement will be most successful when a number of tools are used in conjunction, including consumer surveys, waste composition data, and demonstrated results from reductions in specific institutional waste streams.

6-2-2 Status of Source Reduction

a. Federal Government

The federal government has taken a strong interest in source reduction as one part of an integrated waste management system. When the federal government began addressing the source reduction issue, it sought assistance from Rhode Island officials because Rhode Island was one of the first states to adopt the waste management hierarchy and begin implementing source reduction programs. This eventually translated into formal participation by Rhode Island officials in advisory committees for the U.S. Environmental Protection Agency (EPA) and for the Congressional Office of Technology Assessment (OTA).

Some of the federal actions relating to source reduction include:

- The establishment in early 1989 of a Municipal Solid Waste Program within EPA's Office of Solid Waste to: (1) coordinate source reduction opportunities and recommendations on the national level; (2) develop methodologies for conducting life-cycle environmental analyses (or product-life assessments); and (3) evaluate toxic constituents in the waste stream and explore options for substitutes.

- Between 1988 and 1989, OTA prepared a major study on municipal solid waste, including an examination of source reduction (or "waste prevention"), at the request of three Congressional committees in preparation for the re-authorization of the Resource Conservation and Recovery Act. The OTA report identified four categories of options for federal action to further source reduction efforts: (1) give source reduction high priority within EPA and other federal agencies and set goals for reduction; (2) offer economic incentives to a broad range of organizations or individuals to promote source reduction principles; (3) improve public information flow; and (4) ban specific products or substances.

- Several pieces of federal legislation that contain source reduction components have been introduced. The more noteworthy proposals would require such actions as implementation of source reduction measures by federal agencies,

enforceable packaging standards to be promulgated by EPA, and regulation of batteries, toxic pigments and other potentially toxic materials in the solid waste stream.

In 1991 EPA funded the World Wildlife Fund/Conservation Foundation to convene a Steering Committee that spent a year and a half fully investigating source reduction and making recommendations. This culminated with the report, "Getting at the Source: Strategies for Reducing Municipal Solid Waste." Among other recommendations in the report, the Steering Committee recommended adopting the following definition for source reduction:

Municipal solid waste source reduction is the design, manufacture, purchase, or use of materials or products (including packages) to reduce their amount or toxicity before they enter the municipal solid waste stream. Because it is intended to reduce pollution and conserve resources, source reduction should not increase the net amount or toxicity of wastes generated throughout the life of the product.

In 1994, EPA recognized the need to assist local governments and businesses develop strategies for measuring reductions in volume of solid waste attributable to specific waste reduction actions. Measuring source reduction is challenging, and thus very little has been done to explore this area. However, measurement is essential to providing the feedback necessary to sustain/support government and business source reduction initiatives.

State and local waste managers and representatives of business and industry agree that additional actions should be taken at the federal level to eliminate problems associated with interstate commerce (e.g., when one state attempts to regulate products that are distributed in other states as well) and to establish uniform standards for products and packages.

b. State and Local Governments

Since the late 1980s, many state and local governments have incorporated source reduction activities into their solid waste management programs. Many jurisdictions have established offices of waste reduction that are working to educate consumers and businesses about the need for source reduction and are providing technical assistance to businesses and government offices. Many states and regions have established task forces or advisory committees to develop strategies for source reduction.

Since 1986, the Seattle Solid Waste Utility has provided source reduction public education programs. Funding is provided through a portion of user-fee revenue. The City's source reduction activities increased in 1989 with the hiring of a full-time source reduction specialist. Seattle's source reduction program includes such activities as an innovative backyard composting program (with the City supplying composting bins and in-home trainers for residents), a guidebook to repairing, renting, and buying second-hand items, and technical assistance for businesses.

One of Seattle's primary tools in motivating residents to reduce their solid waste is its rate structure. Seattle employs a user-fee system that offers variable-can rates to residents, providing a direct financial incentive to reduce the amount of waste produced. In addition to one-, two-, and three-can rates, the City also offers a "mini-can" rate to encourage increased reduction and recycling activities.

Minnesota's source reduction program has included model projects at various companies and institutions, including a county government, a hospital, a newspaper publisher, and a hotel convention center. These projects are designed to demonstrate technologically and economically feasible source reduction measures that can be applied by a broad range of waste generators.

c. Private Sector

The private sector is increasingly involved in promoting source reduction. In addition to implementing source reduction measures within their operations, many businesses are also playing a role in consumer education. For instance, many retailers are implementing "green shopping" campaigns, and some manufacturers are advertising their products or packages as "environmentally friendly."

While these kinds of activities can be beneficial to promoting source reduction and increasing consumer awareness of

environmental issues in general, there is potential for abuse. For instance, retailers may unwittingly impart incorrect information about the environmental impacts of particular products, or manufacturers may misrepresent their products in an effort to exploit consumers' desires for environmentally responsible products.

In 1990, Rhode Island moved to control use of the labels "degradable," "environmentally safe," and similar terms (RIGL §23-18.14); the state also set standards for the identification of materials that are packaged in a "source reduced manner" (RIGL §23-18.8-3).

6-2-3 Current Practice in Rhode Island

a. Source Reduction Task Force

Rhode Island initiated its source reduction program in late 1986 by establishing the Rhode Island Source Reduction Task Force, composed of representatives of local industry, academic institutions, environmental groups, and state agencies. The Task Force, aided by \$50,000 funding from the Corporation, explored possible source reduction measures and made recommendations on activities to be pursued. Potential roles of the Task Force include:

- building consensus among diverse groups;
- making policy recommendations;
- providing technical advice;
- supporting legislation with a broad-based foundation;
- assisting in budget development and grant requests;
- serving as a vehicle for consumer campaigns; and
- overseeing source reduction work by Corporation and DEM program staff.

The source reduction activities of the Corporation and DEM can be divided into three categories: research, education, and legislation. Options for source reduction identified by the Source Reduction Task Force, which serve as a guide to the Corporation and DEM, are outlined in Tables 171-6 (1) and (2).

b. Research

Waste Composition Analysis: Acting on a recommendation from the Source Reduction Task Force to identify targets for reduction and develop effective reduction strategies, the Corporation undertook a comprehensive, four-season waste composition analysis in 1989 and 1990. The analysis provides data in the following areas relevant to source reduction:

- types and quantities of some disposable products;
- potential for salvage, reuse, and repair;
- quantity of potentially compostable wastes;
- potential for increased design for recyclability; and
- quantity of hazardous materials from households.

The initial waste composition analysis also provides baseline data that may be useful as one tool in tracking progress towards meeting a source reduction goal. The study can be repeated at intervals, and, combined with other data, should indicate the success of the state's source reduction program.

Reduction/Recycling Plans: As part of the commercial waste reduction/recycling program, businesses are required to examine options for waste reduction and file reduction/recycling plans with DEM. The process of filing the plans has led businesses to reduce their waste as well as to recycle.

Model Projects: Using an element of Minnesota's program as a model, in 1991 the Corporation began attempting to reduce waste through a model projects program. Information gained in assisting one type of generator to reduce waste can be applied to other similar generators. Projects included evaluating the potential for source reduction in state agencies and

hospitals through better procurement practices.

Case Studies: DEM has worked with area universities to research recycling and source reduction techniques implemented by Rhode Island businesses. The knowledge acquired by these studies is being utilized by DEM to help businesses overcome barriers to source reduction.

c. Public Education

The Corporation and DEM have put most of their efforts into the public education element of the source reduction program. Of the options outlined in Table 171-6 (1), public education measures generally are the easiest to implement and, when done well, may prove to be the most effective. Individuals may make simple behavioral changes if they perceive the importance and advantages of doing so. Consumers who are educated about resource conservation issues will be better able to recognize misleading advertising, reject poorly designed products and packages, and demand environmentally responsible products. Further, training the next generation of designers and marketing specialists to think about environmental impact will result in more environmentally responsible products in the future.

Agency program staff have concentrated on the following audiences/targets for education:

■ **Students:** Elementary school children are introduced to source reduction through DEM's two-volume solid waste curriculum, "OSCAR'S OPTIONS," for grades four through eight (4-8). The curriculum includes a chapter on source reduction and was distributed free of charge to Rhode Island teachers through teacher-training workshops. Although the curriculum is no longer available in print, it is available through ERIC (Science, Mathematics, and Environmental Education Clearinghouse), the libraries at the University of Rhode Island and Rhode Island College, and other libraries that maintain ERIC collections.

In 1994 the Corporation completed development of "Solid Waste and the Environment," an updated Teacher-Training curriculum with materials and activities illustrating the principles of source reduction. The production of a video focussing on solid waste and natural resource conservation was completed in 1993. In addition, regular school presentations and tours of the Landfill/Materials Recovery Facility emphasize ways students can practice source reduction.

As the mandatory recycling program expands into Rhode Island schools, there will be increased opportunities for teaching children hands-on source reduction. Many of the strategies that can be used by businesses to reduce solid waste can be applied to school waste. Schools offer an additional opportunity to experiment with waste reduction methods that businesses may be wary of, such as on-site composting. Students trained in these methods will become the next generation of business people who will be more open-minded toward alternative management techniques.

Students at the Rhode Island School of Design and Brown University have been learning about and developing source reduction programs through Task Force representatives from those institutions and through joint projects with Corporation and DEM staff.

Table 171-6 (1)

LIST OF SOURCE REDUCTION OPTIONS

- Media exposure/public outreach
- In-store activities (posters, labels, special events)
- Conferences/forums
- School curricula
- Technical assistance (to businesses)
- Grants/awards
- Management priorities in state solid waste plan
- Source reduction plan
- Resolution for national policy
- Tax credits, exemptions
- Bans (of material, product, container or package)
- Payment for disposal directly linked to waste generated
- Taxes
 - ◆ disposal surcharge (per ton or by volume)
 - ◆ variable fee/local user fee (per bag or can)
 - ◆ on litter generating items only
 - ◆ graduated--on all items or on all items in a product group
 - ◆ on hard-to-handle items only (e.g., tires)
 - ◆ on problem materials only (e.g., hazardous materials)
- Deposits
 - ◆ on containers to be refilled
 - ◆ on hard-to-handle items
- Product specifications
 - ◆ standards required
 - ◆ labelling information required
 - ◆ for government procurement

Table 171-6 (2)

PROGRAM ELEMENTS

Program Element A: EDUCATION

TARGET GROUPS:

- Educators (elementary, high school, college)
- Marketing experts, designers, production staff
- Consumers (individuals, industries/businesses)

MEASURES:

- Media/public outreach
- In-store (posters, labels, special events)
- Conferences/forums
- School curricula
- Technical assistance (businesses)
- Awards and grants

Program Element B: LEGISLATION

TARGET GROUPS:

- Government officials
- Marketing specialists, designers, production staff
- Educators
- Consumers (individuals, industries/businesses)

MEASURES:

Declaration of Policy

- Source reduction priority in State Solid Waste Plan
- Source reduction plan
- Resolution for national policy

Incentive Regulation

- Tax credits/exemptions
- Development of positive labelling and logos
- Direct payment for residential waste disposal

Disincentive Regulation

- Ban (of material, product, container or package)
- Tax
 - ◆ disposal surcharge (per ton or by volume)
 - ◆ variable fee/local user fee (per bag or can)
 - ◆ on litter-generating items only
 - ◆ on all items or all items in a product group
 - ◆ on hard-to-handle items only (e.g., tires)
 - ◆ on problem materials only (e.g., hazardous materials)
- Deposit
 - ◆ on containers to be refilled
 - ◆ on hard-to-handle items only
 - ◆ on problem materials only
- Product Specifications
 - ◆ standards required
 - ◆ labelling information required for government procurement

■ **Consumers:** Rhode Island consumers are learning about source reduction principles through speaking programs, workshops, fact sheets, brochures and other materials developed by the Corporation and DEM program staff. "Use It Again Rhode Island!" a popular booklet that lists over 350 Rhode Island businesses that repair, reuse, sell secondhand goods, or rent items was produced by the Corporation in 1994. The booklet was promoted through radio and newspaper advertisements and as of March 1995, 7000 copies had been distributed to the public, with further distribution

campaigns planned.

Educational campaigns on specific source reduction issues (i.e. holiday waste, reuse, composting) have been executed regularly by the Corporation and DEM. DEM's **Watch Your Waste** brochure, for example, contains tips for source reduction around the house, at the market and for birthdays and holidays.

The Corporation and DEM staff also serve as sources of information for local and national governmental, civic and environmental groups implementing consumer-education programs. DEM's newsletter, **The Rhody Recycler**, updates state and municipal officials on recycling issues and innovative programs. Local residents learn about recycling in their municipality from **Do It Again Rhode Island**, a free DEM publication. The DEM **Pay-As-You-Throw Workshop Guide** and 1995 workshop session instruct municipalities about this approach to financing municipal programs.

Backyard composting is considered a source reduction measure because it avoids the need for centralized composting facilities as well as collection and distribution systems. Both the Corporation and DEM offer various educational and technical assistance programs to Rhode Islanders. One successful strategy employed by the Corporation has been to offer a variety of composting bins and equipment for wholesale cost to Rhode Islanders. The availability of these products has been promoted through special composting bin sales and demonstration events. DEM has targeted consumers through radio public service announcements to encourage home composting, and made a video on home composting and a brochure available to the public on request. The brochures **Turning Your Spoils to Soils** and **Don't Trash the Grass** address composting and grass recycling respectively. DEM has also launched a successful "Grass-cycling" campaign featuring a video which is available free in local video stores or by calling DEM's toll-free number. (See Section 6-3-7, leaf and yard composting, for full details.) The **Yard Waste Composting Guide for Rhode Island Communities** is DEM's guidance on establishing municipal composting operations.

■ **Businesses:** In a 1992 DEM/EPA sponsored study, Brown University concluded that 88 percent of Rhode Island businesses practice at least one method of source reduction. Many businesses practice source reduction without recognizing it because they have a direct financial incentive to reduce the amount of waste produced and to conserve materials. For example, businesses can save money and reduce waste by using reusable distribution packaging, eliminating disposable products, and photocopying documents on both sides of the paper. One goal of the Corporation and DEM is to provide technical assistance to guide businesses in finding additional ways to reduce wastes.

Business people in Rhode Island are beginning to try actively to reduce their waste because they must comply with the requirements of the Commercial Recycling and Reduction Regulations. One component of the regulations requires businesses to submit reduction and recycling plans to DEM for approval. The program staff provides technical assistance to commercial establishments in development and implementation of source reduction and recycling plans. The DEM has developed a seasonal publication (**Business Brief**) which provides source reduction and recycling information specifically for businesses.

The DEM has also developed a "Dollars for Data" source reduction grant program from a model program of the same name in Washington State. Grants will be given to businesses who implement source reduction techniques that are cost effective and easily transferable to other businesses. The grant is intended to offset implementation costs. The grant program is fully developed and ready to implement but has not yet received funding.

■ **Product and Packaging Manufacturers:** Even armed with the best understanding of source reduction, consumers will be unable to make environmentally sound product choices if manufacturers do not offer them. Therefore, the program staff have spent considerable time discussing source reduction with the producers of the things that become solid waste. Forums for these dialogues include national conferences and workshops and well as local events hosted by the Corporation and DEM, in cooperation with the Source Reduction Task Force. These meetings accomplish the following: (1) provide staff, Task Force members and industry representatives with the opportunity to explore creative joint ventures; (2) provide staff and Task Force members with an understanding of waste problems from many different perspectives; (3) provide industry representatives and product/packaging designers with an understanding of solid waste issues and how their activities affect waste management and reduction; and (4) provide staff and Task Force members

with data that can be used to develop educational and legislative measures.

DEM participates on the CONEG Source Reduction Task Force (described below) which has created a set of Preferred Packaging Guidelines for use by designers and manufacturers of packaging. This group also issues the CONEG Challenge, which is a challenge to brand owners to eliminate or reduce packaging. The CONEG Challenge has successfully diverted billions of pounds of materials from landfills and incinerators.

d. Legislation

Rhode Island has had some success in passing source reduction legislation. Although several important initiatives have passed, such as a measure establishing a system for proper return of vehicular batteries to the manufacturer, most are met with significant opposition by representatives of industry or government agencies that are threatened by change. However, the Task Force recognizes that the introduction of legislation, even when unsuccessful, is an important tool for bringing industry to the "bargaining table." Further, because states have been leading the federal government in source reduction activity, federal source reduction initiatives frequently take their cue from legislation introduced at the state level.

Industry's fear of punitive legislation, as well as a growing concern about the lack of uniform legislative requirements from state to state, led in part to the development in 1989 of a regional source reduction task force for the northeast. The Coalition of Northeastern Governors (CONEG) Source Reduction Task Force is composed of government officials from nine northeastern states, as well as representatives of various industries and environmental/public interest groups. One of the group's primary charges is to develop model legislation that all parties will agree to and support. Although consensus-building processes such as this are difficult, it is likely that future source reduction legislation will have its roots in processes such as this one.

6-2-4 Findings

- Rhode Island has made progress in beginning a source reduction program based largely on public education. However, although source reduction is a crucial component of any comprehensive resource and waste management system, it can not be sustained without adequate funding.
- In Rhode Island, citizens find little economic incentive to reduce consumption and, in turn, solid waste, because most Rhode Islanders do not pay directly for solid waste removal and the true costs of waste disposal are subsidized; therefore the costs of excess consumption are not apparent. A user-fee rate system is an equitable funding system that encourages waste reduction and increased recycling.
- Other states and local governments who have well-funded source reduction programs have been able to carry out comprehensive and broad-reaching educational programs for residents and businesses. This includes implementing model reduction programs, such as "Dollars for Data," and offering the technical and financial assistance necessary to convince residents and businesses to modify wasteful behavior by adopting source reduction techniques. Programs from other states can be modified for Rhode Island, thus saving development time and costs.
- Although setting a source reduction goal and measuring the success of the state's source reduction program will be difficult, it is necessary to stimulate action and inspire continued progress toward actually reducing solid waste.

6-2-5 Recommendations

The strategies outlined in section 6-2-3 represent the first step in implementing source reduction programs in the state. However, a stable funding system must be developed to ensure that there will be the additional staff and resources necessary to carry out an effective source reduction program. Although the precepts of source reduction are relatively simple to communicate and implement, a substantial increase in the current level of commitment will be required to broaden the program in order to bring about long-term reductions in Rhode Island's waste stream and to change our current wasteful patterns of production and consumption.

The following recommendations outline the minimum requirements for a continuous and effective source reduction

program in Rhode Island.

a. Achieve stable funding for source reduction and the entire integrated waste management system. Significant work has been done on the part of Rhode Island's environmental, academic, and local governmental communities to explore a strategy for an equitable and sustainable rate system for Rhode Island's integrated waste management system. The user-fee system is the approach that appears most workable and provides the most incentive for source reduction and recycling. Regardless of the technical details of how it will be administrated, such a system will be necessary if a long-term source reduction program is to be successful. Jurisdictions that have implemented a user-fee system have reported significant reductions in solid waste. User fees also provide a source of income that can be readily dedicated to off-setting the costs of source reduction programs.

b. Set source reduction goals. Goals are necessary to move the program forward. Although there are challenges in identifying and setting goals for source reduction, we can use available or attainable information to set goals. For instance, in the short term, we can set goals that target specific components of the institutional, commercial, and residential waste streams (through activities such as **d.** and **e.**, below); changes can then be more easily measured and attributed to source reduction or other factors. These projects will provide information about how much source reduction is possible, which can then be applied to setting longer-term goals.

Once enough information has been obtained from model projects to understand the potential of various source reduction measures, quantifiable goals may be set. Goals should be set over a broad time-frame, and should be reviewed and potentially increased every few years. As more information becomes available, goals should be refined and may even be made sector-specific (e.g., for a particular type of generator of a particular component of the waste stream). As goals are set, a plan and timetable for tracking them should be established.

c. Develop and carry out strategies for measurement of source reduction. DEM currently utilizes the mandatory annual recycling reports submitted by businesses to gauge the success of source reduction in the commercial sector. DEM should continue to use the information acquired from the annual reports to educate businesses and promote proven source reduction strategies. DEM should also encourage the business community to share its expertise and valuable data by assisting businesses with implementing waste reduction projects. The Corporation has already obtained baseline data regarding specific components of Rhode Island's residential waste stream that will be useful in tracking the effectiveness of future source reduction efforts. The Corporation should determine how often this study should be repeated and any refinements necessary to make the data more useful. The Corporation should also move forward on plans to test a measurement strategy for residential source reduction via behavioral studies and waste/recycling composition analysis. (A work plan for carrying out a study in 1995-1996 is in place.)

d. Develop and implement model reduction projects for institutional and commercial waste streams. In 1991, the Corporation undertook a project to identify specific targets for reduction within the waste streams of state agencies. More projects of this type must be undertaken, and the recommendations carried out. Other, similar institutions and businesses can then learn from the successes of these model projects and apply the appropriate strategies to their own waste streams. Such projects will also provide the state with specific data on the potential for various source reduction measures to succeed. Model projects will also provide a means of tracking and measuring reductions in non-residential waste streams.

e. Implement an intensive residential reduction project, in conjunction with an intensive recycling program. This recommendation is similar to **d.**, above, however it focusses on the residential waste stream. This project would entail intensive public education and technical assistance in a specific community to answer the question: "How much are individuals willing to reduce?" If the project showed that with intensive attention and information significant residential waste reduction could be achieved, the state could refine and increase its methods to achieve similar reductions across the state. An additional outcome of the project would be the development of model educational materials which could be distributed throughout the state. The pilot intensive source reduction project scheduled for 1995-1996 is a starting point for fulfilling this recommendation.

f. Increase public education strategies. Public education is a significant key to increased source reduction. With

increased program staff and funding, there are a host of activities that could be undertaken, including the development of multi-media presentations for use by schools, libraries, civic organizations, hospitals and others; consumer-shopping campaigns; regular television and radio public-service announcements and programs; and regular source reduction presentations around the state.

g. Develop a volunteer-trainer program. From the program staff's experience to date, it is clear that Rhode Islanders are attentive and responsive to presentations in which Corporation and DEM staff outline means for reducing waste and individuals can raise specific questions or issues to which the staff can provide an immediate response. Although multi-media presentations are an important tool to reaching more citizens than the program staff can reach individually, the need for these kinds of personal exchanges between citizens and solid waste experts is still great. By developing a program in which volunteers can be trained as waste management experts, the program staff can fulfill the need for individual attention to Rhode Islanders within reasonable budget constraints.

h. Provide increased technical assistance to commercial establishments. The commercial solid waste stream offers substantial room for reduction. More work needs to be done in sharing reduction strategies for commercial waste generators and developing regional and local waste-exchange programs. In particular, developing case studies to demonstrate cost savings from source reduction activities will be an important element to increasing reduction behavior. Savings from source reduction techniques are not always readily apparent; often an initial investment in equipment may be required, after which substantial savings will accrue over time.

Although most large businesses in Rhode Island have found it practical to implement source reduction strategies, the majority of the businesses in the state are small businesses that do not yet perceive the advantage or feasibility of implementing comprehensive source reduction measures. Therefore, the Corporation and DEM should greatly expand current efforts to provide small-business owners with the information and tools necessary to implement practical source reduction strategies.

i. Continue attention to manufacturers. Continued attention must be paid to local and national manufacturers to promote the development of more environmentally sound products and packages. Regional and national source reduction committees provide a good network for promoting source reduction principles to industry, and Rhode Island should continue its involvement in such groups. When cooperative dialogues and incentives fail, pressure must be applied through regulation, media attention, etc.

j. Reactivate and refine the role of the Source Reduction Task Force. Successful operation of the Source Reduction Task Force requires significant administration from Corporation and DEM program staff. The Task Force should be reactivated and its role refined so that overly burdensome administration is not necessary for action. In particular, the Task Force is invaluable for: (1) developing and introducing legislation; (2) assisting with goal-setting and other policy issues; (3) providing expertise on specific issues; and (4) generating media attention around special issues.

k. Cooperate with other state and local governments and continue involvement in regional groups, such as the CONEG Source Reduction Task Force and the Northeast Recycling Council. Regional efforts are important for developing legislation and projects and exchanging information. Further, sharing educational resources with other government agencies is a key method for promoting source reduction at a lower cost, as agencies can adapt and reproduce promotional materials developed by other governments.

6-3 RECYCLING

Recycling is the state's second highest priority for solid waste management. The authority for the mandatory recycling program was established in the 1986 amendments to RIGL §23-18.8, §23-18.9, and §23-19 requiring municipalities, businesses, and state agencies to recycle. This section describes all major recycling programs that are being developed by the Corporation and DEM.

Recycling incorporates four distinct activities: collecting materials, processing them for market, marketing the materials to an end user, and manufacture of the materials into new products. Only in the last decade has recycling been considered a

significant option for waste management. The present focus of the recycling industry is on improving the economics of collection, separating, processing and manufacturing new products from post-consumer materials, on expanding the amount and type of materials that can be recycled, and on strengthening markets.

6-3-1 Municipal Recycling

a. Legal Framework

The framework for the Rhode Island municipal recycling program is established in RIGL §23-18.8, §23-18.9, and §23-19, and further specified by RISWMC policies and DEM Municipal Recycling Regulations. The DEM regulations define the materials to be recycled and provide broad guidelines for the legislative mandate that the Corporation fund for three years "the reasonable additional allowable costs for implementing this [recycling] program for the cities and towns" (RIGL §23-18.8-2 (10)). The guidelines are detailed in DEM Municipal Recycling Regulations, as amended.

Pursuant to RIGL §23-19 and DEM regulations, municipalities have certain responsibilities for implementing recycling. Specifically, municipalities must adopt recycling ordinances that define the residential units to be included in the program, require households to recycle, and establish enforcement procedures. Municipalities also must cover the cost of collecting recyclables after the three years of funding from the Corporation is completed.

b. Definition of Recyclable Material

The materials included in the municipal recycling program are defined in the DEM Municipal Recycling Regulations. The regulations define municipal recyclables as:

- glass food and beverage containers
- tin-coated steel cans/steel cans
- aluminum
- newspaper
- white goods.

In addition, PET soda-type bottles and translucent HDPE milk and juice jug-type containers are collected in all recycling programs and more detailed specifications have been developed for some materials. For example, aluminum is further specified to include aluminum food and beverage containers, foil, pie-type pans, and furniture frames.

RIGL §23-18.8-2(11) directs DEM to redefine the mandated materials and to change them ". . . from time to time depending upon new technologies, economic conditions, waste stream characteristics, environmental effects or other factors." In practice, factors taken into account when determining which materials are defined as recyclable include the amount of materials in the waste stream, the cost of collecting the material, the availability of facilities to prepare the materials for market, the availability of markets, and the adverse environmental or health impacts that may result from disposing of a particular material in some manner besides recycling.

Estimates of the total amount of recyclable materials in the waste stream are available from a four-season waste composition study conducted by the Corporation in 1989-1990. According to the study, materials currently defined as recyclable constitute 19.5 percent of the municipal waste stream (see Table 171-6 (3)), or 95,406 tons per year based on the 1989 municipal solid waste generation of 496,903 tons.

Table 171-6 (3)

PERCENT RECYCLABLES BY WEIGHT IN THE MUNICIPAL WASTE STREAM

<u>Category</u>	<u>Percent of Municipal Waste Stream</u>
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Newspaper	10.50
Aluminum	1.00
Glass containers	5.00
HDPE	0.45
PET	0.55
Tin cans	<u>2.00</u>
TOTAL	19.50

Source: Rhode Island Solid Waste Composition Analysis

c. Current Management Practices

The municipal recycling program is implemented through a cooperative effort by the municipalities, the Corporation and DEM (see Section 171-4 of this plan, Institutional Arrangements). To initiate a municipal recycling program, DEM, in cooperation with the Corporation, prepares a municipal recycling plan. The plan includes demographic and geographic data and a description of solid waste practices. It also lays out the options for recycling, recovery rates that could be achieved by each approach along with the cost to achieve it and recommends an option. Each municipal recycling plan identifies the solid waste savings that could occur as a result of the recycling program including: avoided overtime costs, transfer or local landfill costs, and the capital, operating, and maintenance costs for vehicles. Each plan also provides pertinent regulations, a description of implementation activities, sample bid packages, and sample recycling ordinances.

The municipal recycling plan must be approved by the Corporation, DEM and the municipality. Once approved, it serves as the basis for a grant from the Corporation to the municipality to cover the cost of recycling. The Corporation and the municipality sign a one-year contract, renewable for two additional years, governing the terms of the grant.

DEM provides implementation assistance to each community which includes: technical assistance in drafting municipal recycling ordinances and requests for proposals (RFPs) for collection of recyclables; and help reviewing recycling collection bids; training for municipal drivers, public works crews and secretaries, when necessary. Public education materials including brochures, press releases, banners and newspaper advertisements are prepared by DEM and funded by the Corporation.

In the curbside recycling system implemented in the urban and suburban communities in Rhode Island, each household receives from the Corporation a blue, 14-gallon plastic bin, into which are placed mixed recyclables that are collected at the curb weekly on trash collection day. Dedicated, one-operator recycling trucks pick up the recyclables for delivery to the MRF in Johnston where the materials are sorted and processed for marketing.

For rural Rhode Island communities, the Corporation and DEM have instituted mandatory drop-off programs in which roll-off containers for mixed recyclables and newspaper are placed at the local transfer station. Residents receive blue bins for taking recyclables to the transfer station themselves, or they may contract with a private hauler for collection services. The roll-off containers are transported to the MRF where the recyclables are sorted and processed. The Corporation and DEM have recommended drop-off programs for the remaining rural communities where there is no curbside pick-up. These communities are given three-year grants which will cover the cost of blue bins, roll-offs and hauler fees.

By April 1995, thirty communities had mandatory recycling programs serving approximately 85 percent of the state. Of these 30 communities, seven collect recyclables using municipal crews; sixteen use private contractors to collect; and seven have drop-off programs. In addition to the mandatory programs, 8 communities operate voluntary drop-off programs. It is anticipated that all 39 cities and towns in Rhode Island will have full-scale recycling programs in operation by the end of 1995.

The recycling rate in communities with curbside collection of recyclables ranges from approximately 9.2 percent to over 23 percent with an average of about 14.25 percent. The average rate in communities with drop-off programs appears to be approximately 14.5 percent.

d. Expansion of Recycling to Include Other Materials

The Corporation and DEM conduct research and pilot programs to determine how to increase the recycling rate in Rhode Island.

In 1994-95 the Corporation conducted a Maximum Recycling Pilot Project in Foster. The project included four elements: (1) the separation of the residential waste stream to recycle up to 40 percent, not including composting; (2) intensive education about source reduction and backyard composting; and (3) the reduction of collection costs by utilizing every-other-week collection of recyclables and economic analysis of several alternative collection systems. The fourth element, a volume-based user-fee system, has been recommended by the Corporation and DEM to be implemented when the Maximum Recycling Program is launched townwide. The Corporation and DEM view a user-fee system as integral to long-term success in expanded reduction and recycling, because such a system allows residents to control their waste management costs directly and thereby provides greater incentive to reduce and recycle.

Recyclables collected under the Maximum Recycling Program include the following:

- **Mixed Paper Stream:** Newspapers, kraft bags, chipboard, mail, catalogues/magazines, mixed ledger/office paper, wrapping paper, corrugated cardboard, and textiles (including shoes and handbags); and
- **Containers/Scrap Materials Stream:** Glass food/beverage containers, tin/steel cans, all aluminum, all PET plastics, all HDPE bottles, milk cartons/drink boxes, wood, scrap metal, aerosol cans and paint cans.

Results indicate that recycling these materials can achieve 30 percent to 40 percent diversion.

Expansion of the Maximum Recycling Program townwide in Foster and to other Rhode Island cities and towns is planned upon completion of an expanded MRF.

e. Improvements to Existing Program

Periodically, research is conducted into ways to improve the performance or cost-effectiveness of the existing recycling system. One recent research project, funded in part by the Glass Packaging Institute, evaluated ways to reduce breakage of container glass in the collection, sorting and processing system. Breakage of container glass is a significant problem for the Rhode Island recycling program. By weight, over 40 percent of all glass breaks and ends up as non-recyclable residue.

The study identified and tested modifications to trucks and sorting equipment to reduce breakage. The study found that low-cost modifications reduced glass breakage by 70 percent in prototype studies. In 1995 the Corporation entered into a new contract with the MRF operator. That contract includes the purchase and operation of an optical sorting machine that will allow reclamation of glass fragments down to one-half inch in diameter. Additional broken glass will be reclaimed for mixed glass aggregate markets.

Field Studies have been done in Bristol, Providence, Johnston, Warwick, Cranston and Newport. The studies provided these communities with recommendations to improve collection efficiency, reduce overtime, eliminate the need for additional vehicles, and increase participation.

DEM and the Corporation continue to evaluate potential collection-cost reduction opportunities by analyzing and testing alternative collection systems such as co-collection vehicles and alternate-week schedules.

f. Findings

Based on more than seven years of experience with municipal recycling, the following findings can be drawn:

- Approximately 19.5 percent of the waste stream is composed of materials currently defined as recyclable in Rhode Island.
- Mandatory recycling programs have been implemented in 30 communities in Rhode Island serving

approximately 85 percent of the population. The majority of the programs (23) provide curbside collection of recyclables. The remaining seven programs provide drop-off collection.

- The recycling rate for the curbside programs averages 14.25 percent of the waste stream. The recycling rates in drop-off programs average approximately 14.5 percent.
- Five Rhode Island municipalities have implemented voluntary programs pending initiation of full-scale, mandatory recycling.
- Five communities have user-fee programs in place.
- User-fees can increase participation and recovery rate by 8-13 percent in recycling programs.
- Recycling the additional materials noted for inclusion in the Foster Maximum Recycling Program can divert 30 percent to 40 percent of the waste stream.
- The concept of co-collection is relatively new in North America and is now undergoing rapid development. Numerous municipalities are now testing co-collection of a number of waste streams in a variety of set out and collection configurations to gain a better appreciation of this system.
- Further research is necessary to reduce collection costs of recyclables.

g. Recommendations

- The Corporation and DEM should continue to evaluate the costs and benefits of increasing the recycling rate in Rhode Island from 14.2 to 40 percent (note: composting of leaf and yard waste, recycling of white goods, construction and demolition debris, junk cars and recycling that was occurring prior to the mandatory state program are not accounted for in either of the above recycling rates).
- The evaluation should address the feasibility of recycling various components of the waste stream including options and cost to collect and process, availability of markets and priorities for expansion of program.
- DEM should amend the regulations to include additional recyclables collected in the Foster Maximum Recycling Program.
- The Corporation and DEM should continue to evaluate options to improve cost efficiency and economies of scale in recycling collection and should conduct a co-collection demonstration project to test operating and performance assumptions and the potential economic benefits of the system.
- The Corporation and DEM should also evaluate options to reduce the costs of the existing recycling collection system and explore alternative options for long-term financing for the municipal recycling system.
- Given the current tipping fee assessed municipalities for solid waste disposal, a revised rate structure should be put in place which reflects the true costs of various disposal options.
- DEM has helped develop successful user-fee programs in three communities and is working with CONEG to conduct workshops for municipal officials. DEM should accelerate the implementation of unit pricing for user fees for residential waste which allows flexibility for municipalities to design systems to suit local circumstances.

6-3-2 Commercial Recycling

a. Introduction

The recycling of municipal solid waste has received more media attention and more financial support than the recycling of

commercial solid waste. Despite this, it is generally agreed that a higher percentage of commercial solid waste is readily recyclable.

The DEM Regulations For Reduction and Recycling of Commercial And Non-Municipal Residential Solid Waste (the regulations) mandate that all commercial solid waste delivered to a solid waste management facility be source separated into recyclable and non-recyclable components. Unlike municipal solid waste, the collection and disposal of commercial solid waste is not operated by government or any other central authority. Without an agency to establish recycling programs, each generator of commercial solid waste must implement a recycling program on its own.

Commercial generators who are required to conduct waste audits, implement approved recycling plans, and file annual reports are generally more successful at recycling than those generators who are not required to do so. In 1991, DEM revised the regulations to require plans and reports from all companies with 50 or more employees in an effort to expand compliance with the law and provide additional technical assistance.

The plans describe the entire recycling process for each of the mandatory materials is generated by the company. The business must also list any material it generates in a large quantity. Once approved, the plan must be fully implemented within 60 days. DEM commercial recycling program personnel may inspect and offer technical assistance to businesses as necessary to maximize the efficiency of their programs

Businesses with 50 or more employees are also required under the regulations to file annual reports. The report includes information on quantities of material recycled and where it was recycled, as well as start up costs associated with recycling and the amount of money saved or spent by recycling. These reports were evaluated in an EPA-funded study which determined that these businesses are recycling approximately 34 percent of their waste. These reports are evaluated periodically to examine trends in commercial recycling.\

b. Composition of the Commercial Waste Stream

Commercial solid waste typically consists of a large percentage of recyclable materials, such as office paper and corrugated cardboard. The best data about the composition of the commercial waste stream comes from a study conducted in Westchester County, New York. This study estimates that waste from an office building consists of 65 percent recyclable paper and 15 percent recyclable corrugated cardboard. The following table contains the study's estimates of the composition of the waste stream of other typical businesses.

Table 171-6 (4)
COMMERCIAL WASTE COMPOSITION

<u>Generator Segment</u>	<u>Paper</u>	<u>OCC</u> ¹	<u>Plastic</u>	<u>Metals</u>	<u>Other</u>	
Office		65%	15%	6%	2%	12%
Industrial		35%	20%	25%	6%	14%
Retail		35%	40%	8%	1%	16%
TCU ²		20%	15%	15%	5%	45%
WWD ³	25%	32%	25%	7%	11%	
Public ⁴	45%	10%	5%	6%	34%	

Source: "Estimating Recyclables in the Commercial Waste Stream,"
David S. Cerrato, Malcolm Pirnie

The following chart lists the amount of commercial solid waste disposed of at the Central Landfill in Johnston from 1987 through 1994:

1987	599,380
1988	530,014
1989	356,787
1990	226,112
1991	189,814
1992	253,740
1993	182,957
1994	259,483

These figures do not account for commercial waste disposed at other locations, the portion of the commercial waste stream that has been historically recycled, or increases in recycling from 1989 through 1994. When considered in context with the waste composition data, it is apparent that at least 200,000 tons per year of material from the commercial waste stream could be recycled.

c. Federal and State Regulations

1) **Federal:** Presently, there are no federal regulations regarding the recycling of commercial solid waste.

2) **State:** The Department of Environmental Management's Regulations for Reduction and Recycling of Commercial and Non-municipal Residential Solid Waste (June 1991), require that all generators of commercial solid waste and non-municipal residential waste source separate mandated materials from their solid waste for recycling. Commercial Solid Waste is defined by these regulations as all solid waste that is not characterized in law or regulation as municipal solid waste, non-municipal residential solid waste or hazardous waste. Commercial solid waste also does not include solids or dissolved material in domestic sewage or sewage sludge. Non-municipal residential waste is defined by

¹ OCC: Old Corrugated Cardboard

² TCU: Transportation, Communication, Utilities

³ Wholesale, Warehouse, and Distribution

⁴ Includes Institutional

these regulations as solid waste generated by residents in the course of their daily living for which the municipality does not take responsibility for disposal.

The list of mandatory commercial recyclables includes:

- aluminum;
- automobiles;
- coated, unbleached, kraft beverage carriers;
- corrugated paper;
- HDPE plastic milk and water jugs;
- glass food and beverage containers;
- laser toner cartridges;
- leaves and yard waste;
- newspaper;
- PET plastic food and beverage containers;
- sorted colored ledger paper or any component thereof;
- steel or tin coated steel cans;
- telephone directories;
- used lubricating oil;
- vehicle batteries; and
- wood waste.

These materials must be segregated and kept in a condition to meet minimum market standards. The regulations apply to any person who generates commercial solid waste, to any manager of multi-unit housing⁵ in which non-municipal residential solid waste is generated, to any person who segregates recyclables from commercial or non-municipal residential solid waste or who delivers commercial or non-municipal residential solid waste to a Corporation facility, and to any operator of a solid waste disposal facility located in Rhode Island. DEM is revising the regulations for public hearing in 1995.

d. Management Practices

DEM administers planning, technical assistance, reporting, inspection and enforcement programs. The Corporation operates a technical assistance program and also, at the Landfill, an enforcement program.

Under the DEM regulations, businesses with 50 or more employees are required to file plans that describe materials to be recycled and the method of separating and marketing those materials. The generator is required to keep records of the amount of material recycled and to report that information to DEM annually upon request. DEM inspects businesses to check compliance with their plans. Businesses that refuse to file plans, are not in compliance with their plans or do not file annual reports may be issued a notice of violation and fined. This path is taken only after efforts to provide on-site assistance fail.

The present system of requiring commercial generators to conduct detailed waste audits, file recycling plans, submit annual reports and possibly undergo site visits by DEM staff is based on the belief that for recycling to work there must be accountability. To date DEM has over 800 approved recycling plans on file and has visited over 400 businesses.

Although current practices promote compliance, the annual reporting requirement has created the burden of processing some 800 reports a year. Also, present staffing does not allow for a full-time compliance inspector. In addition, the lack of a reliable list of Rhode Island businesses containing key information such as: number of employees, current address, S. I. C. code, and the name the company does business under, seriously hampers the management of the program.

⁵ For discussion of Multi-Family see Section 6-3-4.

The current regulations require generators of recyclables to recycle all the mandatory recyclables regardless of the quantity. A study of the current program by Brown University's Center for Environmental Studies concluded that a compliance rate of 100 percent by businesses was not realistic since generators of small amounts of recyclables were experiencing difficulty in marketing them. Brown University proposed that allowances be made for those businesses that generate insignificant amounts of recyclables. DEM has written recommended de minimus standards into the next revision of the regulations.

In addition to commercial generators, brokers are also required to report their recycling activities annually. By reporting the amounts and types of recyclables brokered annually, it was believed that the movement of recyclables could be effectively tracked through the recycling stream. However, the present reporting requirements for brokers has proven ineffective as the definition of broker is too broad and allows for the double-counting of recyclables as they pass through the waste/recycling stream. Also, many recyclables generated in Rhode Island are handled by out-of-state brokers which DEM has no authority over. Therefore, the revised regulations narrow the list of those that have to report to intermediate processing, or material recycling facilities.

Another element of the current enforcement system is the Corporation's enforcement plan for the Landfill. Under this plan, revised in October 1991, all loads of waste are to be inspected for recyclables. If a load contains a significant amount of recyclable material, the waste inspector notes the name of the hauler and tries to determine the source of the load. DEM and the hauler are to be notified that recyclables were detected, and DEM ascertains whether the generator of the load has a recycling program in place. If DEM certifies to the Corporation that no program is in place, the generator will not be permitted to tip at the Central Landfill until a program is established.

A more aggressive approach to small business recycling is necessary to fully implement commercial recycling in Rhode Island. Small businesses encounter many barriers to recycling including: lack of knowledge of their responsibilities, little potential for savings in trash hauling or disposal costs, large potential for increased collection costs, inability on the part of business owners to devote the time necessary to start a program, lack of storage space for source-separated materials, lack of a regulatory requirement to file a recycling plan, high start-up costs and lack of DEM funding for a small-business technical assistance program. It is impractical for all 25,000 Rhode Island businesses to file recycling plans with DEM. An aggressive small-business technical assistance program must be developed to adequately recover the valuable recyclables generated by that sector. As a first step towards that end, DEM is preparing an information packet for small businesses which details their responsibilities under the regulations and provides simple guidance on setting up a program, conducting a waste audit, contracting with a hauler, etc. This packet should be complete by fiscal year 1996 and will be made widely available through various means.

In order to assist small generators, the Corporation has established a drop-off site for recyclables at the Landfill facility. The site currently accepts yard waste, wood, mixed recyclables, newsprint, corrugated cardboard, mixed wastepaper, telephone directories, and scrap metal. This site alone, however, will not prompt large increases in commercial recycling by small businesses since most waste generated by small businesses is collected with other similar waste before disposal.

Other concepts to maximize capture of commercial recyclables include cooperative drop-off sites and curbside collection programs. Cooperative marketing programs should also be explored. These alternatives deserve serious consideration. DEM should seek funding to study the alternatives and implement practices appropriate for Rhode Island businesses.

Most businesses rely on their trash haulers to provide recycling services since commercial recyclables are not collected, sorted or marketed collectively or through a central agency. Most haulers offer recycling services ranging from installing a source separation program and collecting the recyclables separately from solid waste, to collecting all waste together and sorting out the recyclables at a transfer station. Most haulers have worked with local brokers to market office paper and corrugated cardboard, while some have established relationships with end users. In addition, larger manufacturing businesses have developed market connections that have enabled them to recycle materials used in manufacturing, such as scrap plastics.

e. Future Management Practices

DEM will adopt new regulations concerning commercial recycling in 1995. These revisions will accomplish several

things which will allow DEM to manage the commercial recycling program more effectively. Among them are definitional changes which clarify who the regulations apply to and narrow who is required to report recyclables processing information. This will enable DEM to generate a clearer picture of generation and processing in the state which is key in determining progress and will assist in development of recycling market development strategies. A new regulation will allow generators of small amounts of recyclables to apply for a variance which will exempt them from the requirements. This will simplify enforcement policies and procedures.

In addition to regulatory changes, DEM will be revising the reporting process and forms. The report form currently in use is lengthy, resulting in a cumbersome and time-consuming data entry process. Additionally, as with any manual data entry, the potential for human error is high. To counter these obstacles, DEM plans to go to a "bubble" report form, similar to that used for a scholastic achievement test. Program staff have been working on a revised report that lends itself to that format, and several business owners who use the report have offered to assist in finalizing its development. This change will greatly enhance DEM's ability to track and monitor the progress of commercial recycling in businesses with 50 or more employees and in state agencies. The equipment purchased to implement this change will also be used by other programs within the office that have a reporting element.

f. Findings

- Solid waste from business and industries can be cost-effectively recycled. Aggressive recycling, especially in larger businesses, can be both a sound economic and environmental business decision.
- Given enough technical and compliance assistance, Rhode Island businesses could recycle significantly more material, saving on solid waste disposal and capacity and conserving resources. Such programs are staff intensive.
- It is estimated that 14 percent of the commercial waste stream is presently being recycled from businesses with 100 or more employees.
- Businesses are finding it difficult to recycle small amounts of recyclable material.
- Ninety-seven percent of Rhode Island's businesses employ less than 50 people, and these are the businesses that find recycling most difficult to implement.
- There is currently no mechanism which DEM can access to identify Rhode Island businesses that are subject to the regulations.
- Greater effort to provide technical assistance and eliminate the cost of recycling for small businesses is necessary to fully implement commercial recycling.
- It is difficult to track the amount of commercial solid waste that is being generated and recycled.
- Recyclables being tracked through brokers, as currently defined, are often counted more than once.
- The current reporting system is unnecessarily burdensome for DEM staff.
- DEM has the expertise but lacks the funding and resources to provide more technical assistance and compliance programs to drive commercial recycling.

g. Recommendations

- DEM should implement an on-going education program aimed at the business community to apprise them of materials that are classified recyclable, ways to recycle, and the benefits of recycling.
- DEM should explore the need and feasibility of commercial curbside collection and cooperative commercial drop-off sites.
- DEM should seek funding to develop a small-business assistance and grant program as soon as possible.
- DEM should explore the feasibility for tracking small business recycling progress using the revised and simplified planning forms.
- DEM should continue to aggressively enforce the requirements of the regulations.
- DEM should continue to implement a streamlined, more efficient reporting system.
- Recyclables should be counted at transfer stations and MRFs instead of at every point of handling.
- DEM should continue to explore ways, including a legislative change, to obtain a list of Rhode Island businesses from the Department of Employment and Training in order to maximize compliance with the regulations.
- Enforcement of commercial recycling at the Landfill should be designed to maximize compliance with all state

and federal regulations.

- The Corporation should expand its recycling drop-off operation at the Landfill by accepting more materials and adopting a differential rate structure.

6-3-3 State Agency Recycling

a. Legal Framework

In Rhode Island, recycling of 16 items is required for all state agencies under the *Regulations for Reduction and Recycling of Commercial and Non-Municipal Residential Solid Waste*. Under Rhode Island General Law 42-20-16, all state agencies must submit a recycling plan to the Department of Environmental Management (DEM). The purpose of these plans is two-fold. First, they allow the agency to gather critical information needed to plan and implement a successful recycling program. Second, they open up a line of communication between the DEM and the agency. Plans are submitted to the DEM for review to ensure the program is easy to implement and will achieve the desired results. Once the plan is approved, the agency has 60 days in which to implement the program.

b. History

Under the State Agency Recycling Program, which was initiated in January 1989 as a component of the Commercial Recycling Program, each state agency selected a recycling coordinator, and state employees became responsible for separating recyclables from the rest of the waste.

DEM's role in this program is one of coordination: DEM held educational meetings for all coordinators; provided desk top recycling boxes; and conducted training seminars on planning and implementing a recycling program at any agency's request.

The departmental recycling coordinators are responsible for program implementation and staff participation. One role of the State Agency Recycling Coordinator at DEM is helping to solve problems departmental recycling coordinators have with their agencies or hauler and problems the hauler has with specific offices.

In the past, implementing a state agency recycling program was difficult for several reasons:

- Collection of waste and collection of recyclables was performed, in many cases, by two different haulers. Waste collection went out to bid and a standard three year contract was entered into. Recyclable collection, on the other hand, was handled on a master price agreement (MPA). Two haulers servicing the same location often resulted in misunderstandings between haulers and the agency.
- Waste hauling was figured into yearly budgets while recycling was not.
- State janitorial contracts did not reflect collection of recyclables as a duty. As a result, several incidents arose where janitors refused to handle recyclables because it was not in their job description.
- In some cases, state agencies are located in leased spaces and waste removal is included in their lease. It is difficult for these agencies to revise their waste hauling system.

c. Solutions

All of these aforementioned difficulties have been or are being resolved with changes in contract structure or contract language.

- Blanket bids covering both waste and recyclable removal are being implemented as old waste hauling bids expire. Blanket contracts provide one hauler for both waste and recyclables and eliminate the confusion associated with MPA's. They also consolidate billing.
- Janitorial contracts now contain language reflecting the handling of recyclables as a duty.
- DEM provides agencies entering into new leases with sample recycling language that can be incorporated into the new lease agreement.

d. Monitoring Progress

In an effort to track the progress of state agency recycling programs, waste haulers for these agencies are required to submit, on a quarterly basis, reports on waste and recyclable generation in state agencies. Reporting is included as a requirement in blanket bids and purchase orders. The first reports were received in July 1994. Included in these quarterly reports is information on containers for recyclables (sizes, quantities and estimated fullness), pick-up frequency, and total waste generation. The data in these reports will enable the DEM to evaluate the success of an agency's program. The results will be reported back to the directors of the agencies along with suggestions for improvement once enough data has been gathered to analyze. Visits by DEM personnel will be conducted when needed.

e. Findings

- Several mechanisms have been implemented which have removed the traditional barriers to state agency recycling.
- Recycling programs are steadily being implemented and improved by state agencies.
- Annual progress reports to agency directors will provide an indication of the efficacy of their agency's program.
- Training coordinating and monitoring state agency recycling is a staff-intensive task.
- DEM lacks the funding and personnel to further improve the State Agency Recycling Program.

f. Recommendations

- The DEM should explore incentives to improve the participation in, and results of, state agency reduction and recycling programs.

- Inspections should be conducted to ensure state agencies have implemented effective programs.
- Once the collection system is functioning properly, DEM staff will need to update state employees on how their program works.
- Education by DEM and the state agency recycling coordinators must be an ongoing component of this program.
- DEM should find a source of funding to provide staff to improve state agency recycling programs.

6-3-4 Multi-Family Recycling

a. Introduction

In the Rhode Island waste management system, solid waste that is generated in residences is divided into two categories, municipal solid waste (solid waste from buildings with one to four units) and non-municipal residential solid waste (solid waste from buildings with five or more units). The latter is treated as a sub-category of commercial solid waste. Municipal solid waste is defined as residentially-generated solid waste for which a municipality has assumed disposal responsibility. All other residentially-generated solid waste is considered non-municipal, and hence commercial. Most municipalities have taken responsibility for the waste generated by all single-family residences within their borders and for multi-family complexes with four or fewer units. However, the cut-off point varies, with some communities assuming responsibility for all residentially-generated solid waste. The distinction is codified in RIGL §23-19-5(21), as well as in the DEM Regulations for Reduction and Recycling of Commercial and Non-Municipal Residential Solid Waste, as amended in June 1991.

Most multi-family complexes use a dumpster for trash collection, rather than trash barrels with curbside collection, making it impractical to establish municipally operated recycling programs for curbside collection of recyclables for multi-family complexes that did not have curbside collection of trash. Therefore, a different system of collecting recyclables from multi-family units is in place.

The DEM regulations cited above establish the same materials collected in the curbside municipal recycling program as those that must be recycled by multi-family units.

b. Quantity of Materials

Over 13,000 of the 80,000 Multi-Family units in the state of Rhode Island have recycling programs in place. Hard data on the amount of material being recycled by these units is not available. The State estimates that 5.5 pounds of recyclable material is recoverable from each multi-family unit. This figure is based upon 1980 U.S. census data that indicates that the average multi-family household is 66.7 percent the size of the average single-family household. Since the observed average for recovery of recyclables from single-family homes is 8.2 pounds per week, the estimate of 5.5 pounds has been derived by taking 66.7 percent of 8.2 pounds. Using this estimate, 80,000 multi-family units would be expected to generate 220 tons of recyclables per week, or 11,440 tons per year.

c. Federal and State Regulations

1) Federal

There are no federal regulations governing recycling from multi-family units.

2) State

The DEM regulations require managers of multi-unit housing to prepare a plan for source reduction and recycling and to ensure that recyclables are separated from solid waste at the source or to contract for recyclables to be segregated before the waste is delivered to a solid waste management facility. The plans include a waste audit, a description of the process

by which recyclable materials are to be segregated from the waste, and a plan for reduction of the amount of solid waste generated. Multi-family recycling plans are submitted to DEM and, if applicable, to the recycling coordinator in the city or town in which the multi-unit housing is located.

d. Current Management Practices

The DEM regulations require all multi-family units in a municipality to begin recycling not later than 180 days after the municipality has implemented a mandatory municipal recycling program. In practice, this schedule has not been enforced due to staffing constraints at both DEM and the Corporation as well as the absence of a comprehensive list of multi-family complexes. The current practice is to implement programs upon receiving a request from someone in multi-family complexes.

The Corporation and DEM have been providing technical assistance for implementing a program only to multi-family complexes that request it. The primary method of implementing recycling in multi-family units has been through the filing of the recycling plan with DEM. Upon approval of the plan, the Corporation has provided, free of charge, one six-gallon recycling pail for each unit and public education materials to help start the program. The housing complex management has been responsible for working with a recyclables hauler to provide a collection point in the complex for the materials. The state has recommended, and most units have adopted, a system in which the six-gallon buckets are tipped into a larger toter-type container located next to the trash dumpster. The intention is that when a resident brings out the trash to the dumpster, he/she will bring the recyclables to the toter. Some multi-family complexes have implemented a program where recyclables are placed in plastic bags and deposited in the trash dumpster. The Corporation and DEM do not encourage this approach.

The collection and transportation of recyclable materials to market is the responsibility of the housing complex manager. Almost all complexes have contracts with private haulers to bring their materials to the Johnston MRF. Those complexes in communities that do not accept responsibility for the solid waste are charged a \$20 per ton tipping fee (because the material is considered commercially-generated). Recyclables from multi-family unit complexes where the municipality has accepted the responsibility for disposal are treated like municipal waste and are not charged. For the tipping fee, the Corporation provides a guaranteed market for mandatory recyclables that meet quality specifications.

The implementation of the 13,000 units that are currently on-line has not been systematic. Instead, it has been accomplished because of the advocacy of local recycling coordinators, the interest of trash haulers, and the desire of residents to start programs in their complexes. The Corporation has maintained a database which lists apartments that have approved plans and received recycling buckets.

The Corporation has conducted site visits of approximately 60 of the 116 complexes which have received recycling buckets. A site visit inspection form was completed at each visit and involved interviewing the building manager about the program, as well as inspecting apartment buckets, recycling totes, and trash dumpsters. Common problems at all these locations included plastic bag and mixed plastics contamination, poorly labeled totes, mixing up newspapers and mixed containers in the totes, and poor education. Because of the high turnover of the tenants at these complexes, new tenants were not getting properly educated about the programs when they moved in, or did not receive new buckets if previous tenants had taken theirs. Because some tenants choose not to use the buckets, but use plastic bags to store their recyclables instead, they dump the plastic bags in the totes with the recyclables inside.

e. Future Management Practices

A joint effort among DEM, the Corporation, and municipalities is needed to implement the remaining multi-family units. However, staffing and enforcement constraints as well as the lack of a list of all multi-family units are likely to slow the pace of this project. The Corporation remains committed to providing six-gallon pails and public education materials to all complexes that plan to implement a tote-based program.

f. Findings

- The Corporation has conducted site visits of many of multi-family complexes and has determined problems that are common to almost all of them.
- The remaining multi-family units cannot be implemented without a joint effort among the Corporation, DEM, and the municipalities as well as more staff people from all the agencies assigned to that task.

g. Recommendations

- The Corporation should continue to supply recycling buckets and public education materials to all multi-family complexes that begin recycling, and should develop new brochures in Spanish and Asian languages.
- As part of providing the recycling containers to complexes, the Corporation should develop a strategy for requiring multi-family complexes to write in their leases that recycling buckets belong to the building and are not to be removed when the tenant moves out. If they are removed from the apartment, the cost of replacing the bucket will be taken from the security deposit.
- The Corporation should develop a policy relating to replacing recycling pails and providing follow-up education for new tenants.
- The Corporation staff should strongly encourage building managers to explain the recycling program and distribute the flyers to each new tenant prior to moving in, preferably when the lease is discussed. This will provide the constant educational reinforcement that is necessary in multi-family complexes.
- The Corporation should work with haulers to provide educational stickers for totes which explicitly outline the kinds of materials which are acceptable and which emphasize emptying recyclables out of plastic bags and disposing of the bags in the trash.
- To increase the longevity of educational materials within each unit, the Corporation should create special refrigerator magnets which depict the recyclable materials. The effectiveness of these magnets should be tested on a specific apartment complex to determine if the increased cost would be offset by their long-term effectiveness within each

unit. If this approach proves more effective and cost-efficient, these magnets could then replace the flyers the Corporation provides to the multi-family apartments.

- The DEM planning system for multi-family complexes should be continued.
- DEM's Commercial Recycling Regulations should be reworded to ensure that the complex owner is responsible for "solid waste management," as well as for *maintenance of the recycling program*. Although many managers do take on this role as an agent for the owner, it is ultimately the owner's responsibility to comply with regulations; this responsibility is not explicit in the current regulations. This would enable better enforcement that could lead to a higher compliance rate and better communications among tenants, owners, and managers about recycling.
- Although technical assistance and education will be the primary means of initiating and maintaining multi-family recycling programs, in order to increase compliance, more active enforcement of the regulations is an important tool that must be used to the extent that DEM's funding and staffing will support.

6-3-5 School Recycling Program

Implementing recycling programs in Rhode Island's public and private schools (K-12) is important for a number of reasons, but perhaps the most important is that it helps instill a conservation ethic and good recycling habits in children early on. In fact, DEM and the Corporation consider that the primary goal of the school recycling program is to educate children to become accustomed to participating in recycling programs both at home and away from home. The long-term goal is to implement recycling programs that are sustainable with minimal enforcement. A secondary goal is to recover the large quantities of waste paper, corrugated cardboard, and mixed containers that are generated in schools. The school recycling program is designed to be a low-cost program. The goal is to make the program sustainable with only minor assistance from the Corporation for bins, educational materials, and market coordination.

a. Background

The first recycling programs in Rhode Island schools were implemented in 1989. Since then, the Corporation has worked with municipal and school department officials to implement programs in 26 school districts.

School waste recycling is governed by both the commercial and municipal recycling regulations, depending on each school district's arrangements. Public schools are generally able to use municipal recycling trucks and tip commingled recyclables for no charge; private schools cannot, as they must develop collection systems with a private waste hauler, and their waste is charged the commercial tipping fee. (There are a few municipalities in which private schools are included, but this is rare.)

Implementing programs in public schools has been the initial focus of the school recycling program. The Corporation mailed implementation information to all 96 private schools in the state, and approximately one-third of those responded and received bins and posters. Continued site visits to these schools would be necessary to determine if all are, indeed, recycling.

b. Materials Collected for Recycling

Of the 16 mandatory recyclable materials, the following materials are collected from schools for recycling: tin food and beverage containers, aluminum, glass food and beverage containers, PET and translucent HDPE food and beverage containers, newspapers, and classroom/office papers. (The definition of classroom/office paper varies depending on the local markets. It can be as restrictive as only white and colored ledger, plus computer paper; or it can include additional materials such as glossy paper, construction paper, etc.) In addition, most schools collect corrugated cardboard, although some find the collection logistics prohibitive. The *Regulations for Reduction and Recycling of Commercial and Non-municipal Residential Waste*, which regulate school recycling, currently make no provision for poor market conditions.

c. Corporation's Role

The Corporation works directly with school districts and municipalities to establish recycling programs in schools. The Corporation is responsible for several components of implementing the program: (1) initiating action in public schools; (2) providing technical assistance and evaluations; (3) providing bins for all classrooms, cafeterias, and office areas; (4) providing educational materials, such as posters and coloring books; (5) assisting teachers/other staff in promoting the program; and (6) developing outlets for classroom/office waste paper.

Whenever possible, school districts are encouraged to find their own markets for materials. However, in general the Corporation's MRF has been the repository for newspapers and commingled food and beverage containers. In addition, to assist schools in finding low-cost solutions, since 1990 the Corporation has arranged for outlets for low-grade classroom/office paper, including entering into a contract with a paper mill.

In municipalities that employ a recycling coordinator, that person generally has been the school department's primary administrator of the recycling program during the implementation period. In communities without a recycling coordinator, the Corporation has worked directly with school department and municipal officials.

After developing the collection, transportation, and marketing arrangements for some types of recyclables, the next step is to work with school administrators to solicit volunteers from each school to oversee the recycling program's implementation. These volunteers are responsible for additional promotion among their peers--both professional staff and students--and for observing the program and reporting or attempting to resolve any problems. The Corporation staff guides these volunteers and offers other sources of educational information as well as additional ideas for activities to engage students.

Finally, after a program has been in operation for several months, the Corporation re-visits schools to evaluate the success of the program and correct any problems, such as contamination of materials. Issues of concern are discussed with the individuals overseeing the recycling programs in each school; these individuals are responsible for on-going program monitoring.

Although problems of contamination, confusion, or apathy will be common in the initial stages of implementing recycling in schools, the goal is to make recycling second nature to everyone. As more young people are taught to recycle at an early age, the next generation will make recycling at home, school, and work part of their standard routine.

d. Barriers

- **Coordination:** Since the recycling programs were implemented several years ago in the schools, follow-up visits and phone surveys have shown that many programs, particularly in high schools and middle schools, are generally failing, or mediocre at best. The problems stem from many areas, but in general the success of a school recycling program is largely dependent on the presence of a coordinator from within the school, (or at least within the school district). It has appeared that school recycling almost inevitably fails without active, interested people to regularly oversee the programs.

Coordinators have generally been teachers and student groups, but they have also come from within the administration and custodial staff. Most of these coordinators are enthusiastic people who have volunteered to take on the task. Because the Corporation can only recommend that the schools assign volunteer coordinators, there is little control over whether this occurs, and thus, over the success of a program once it is implemented. Without these coordinators, school programs require constant monitoring and maintenance from the Corporation, which is impractical due to staff and time constraints. Also, due to transient populations at the schools, the recycling program requires consistent educational reinforcement and monitoring. Without an in-school coordinator, this becomes virtually impossible.

- **Administration:** Problems often stem not only from within the schools themselves, but also from the school district administrations. Administrators may put little or no importance on their recycling programs and do nothing to resolve problems when they arise. As an example, an entire school district's recycling program has been halted because the administration has never solidified a paper collection system with its waste hauler even though a strategy was developed from several meetings with the Corporation, the custodians, and the waste hauler.

- **Enforcement:** Although school recycling is mandated by the Commercial Recycling Regulations, it has been treated as a voluntary program to this point because the primary focus has been on education. Schools that do not comply have not received any violations or had fines levied against them since the regulations were issued. Any fines or penalties would be assessed against the municipality which may not be directly involved in the recycling program. DEM has funding and staffing constraints which have limited DEM's ability to enforce the regulations against schools and municipalities. The Corporation must warn municipalities and schools that they are not complying with a regulation that both parties know are difficult to enforce. Proper enforcement procedure dictates that DEM staff verifies all allegations of non-compliance before enforcement may occur. This procedure is necessary yet staff-intensive.
- **Collection Logistics:** Other barriers to the recycling program include logistical problems with collection such as lack of storage space, dumpster contamination from neighborhood residents, and poor communication with the hauler, all of which can contribute to the demise of a recycling program. In addition, collection problems arise because schools using private haulers must go out to bid for new haulers every few years. This disrupts the continuity of an established program because new haulers change the types and amount of containers they provide, as well as the collection procedures. Also, schools do not necessarily include recycling collection in their contracts with new haulers. Schools with municipal collection have problems with storage and with transportation of the materials to a recycling facility.
- **Fire Codes and Summer Cleaning:** Fire codes prohibit overnight storage of paper (inside plastic totes) inside the buildings and, in some cases, placing recycling posters on the walls. Many schools clean all their classrooms over the summer and remove posters and recycling bins, most of which do not get returned in the fall, despite letters from the Corporation in the spring and fall reminding administrators in all schools of this.

e. Findings

- The primary goal of the school recycling program is to train the next generation to be sensitive to the needs to conserve natural resources; one part of this is making recycling program participation second nature.
- The Corporation has developed a strategy for implementing recycling in Rhode Island's public schools that provides bins, educational materials, and technical assistance.
- The Corporation has developed outlets for low-grade waste paper from classrooms and offices; it is expected that future markets will be available without the Corporation's assistance. The MRF is likely to continue to be the repository for mixed bottles and cans. Further, as the MRF expands, collection will likely be even easier for many municipalities as newspapers can be mixed with low-grade paper without the use of bags.
- Private schools, which (in most cases) are not eligible to use municipal recycling vehicles and have not received the same intensive guidance and hands-on assistance from the Corporation, are lagging behind public schools in recycling implementation.

- Virtually all programs require intensive follow-up monitoring and correction, and are difficult to maintain year after year, especially in middle and high schools.
- Schools with established coordinators have more successful programs than those without immediate oversight.

f. Recommendations

- The Corporation should continue to assist with implementation of recycling in remaining public and private schools.
- Any new schools should receive free recycling bins/materials. The Corporation's Bin Replacement Policy should remain in effect.
- Corporation staff should make regular queries or site visits to school districts once programs have been implemented.
- The Corporation should develop a systematic approach for assisting those private schools still not recycling by implementing recycling programs and by visiting schools who have implemented programs. Through the Commercial Recycling Planning process, DEM can assist by making private schools aware that the Corporation is able to provide some technical and financial assistance.
- Once recycling is successfully implemented in a school district, attention should be paid to educating teachers and students about source reduction and composting. (See appropriate sections.) As much as possible, source reduction and composting projects should be implemented as well.
- The Corporation and local recycling coordinators should conduct site visits and notify DEM of violations. The Corporation should continue to advise schools of the requirement to recycle as part of site visits.
- The Corporation and DEM should develop a joint strategy for addressing the issue of schools whose programs are not maintained. This strategy should address the need for each school district to be responsible for and capable of successfully administering its own recycling program without continued outside assistance. Legislation has been introduced in 1995 to partially address this issue as well.
- The Corporation should explore potential incentives beyond the existing technical assistance programs offered that would encourage improved compliance with recycling mandates. This effort should include a mechanism for accurate reporting by school districts in order to be eligible for special assistance.
- The DEM should review its enforcement policy, and if necessary, pursue additional funding in order to increase schools' compliance with recycling requirements.

6-3-6 Recycling Market Development

Developing markets for recyclable material has become a major component of DEM's Commercial Recycling Program. A range of activities are covered under this element of the program. DEM frequently works with the Department of Economic Development on related legislation and grant proposals and they often meet together with recycling business interests. DEM works cooperatively with the Department of Administration/Office of Purchases on state recycled product purchases and policies. DEM also works with non-profit organizations, private institutions and trade associations when appropriate opportunities arise.

a. Remanufacturing Research/Implementation

In the summer of 1993, DEM received a \$5000 grant from the U.S. Department of Energy, which DEM matched, to conduct a remanufacturing research project. A graduate student from the University of Rhode Island's (URI) Chemical Engineering Department was hired to conduct the research. Plastics and textiles were chosen as target materials and companies that worked with the DEM's Pollution Prevention program were approached. The project resulted in finding a 100 percent post-consumer polystyrene replacement for 100 percent virgin polystyrene at an investment casting company for two-thirds the cost.

Upon the conclusion of this project, it was determined that a more comprehensive approach to reviewing manufacturing processes was desirable. In May 1994, DEM hired a graduate student for the summer from URI's nationally recognized Industrial Manufacturing and Engineering program to analyze over 60 manufacturing processes for the potential to utilize post-consumer materials.

The outcome of the second project presents a strategy for moving ahead with remanufacturing in Rhode Island. (The findings can also be applied nationwide.) The research concluded that over one-third of the processes analyzed have potential for further research and testing. The majority of the targeted processes involve plastic with the remainder involving glass.

A survey of Rhode Island manufacturers conducted during the second project revealed five companies using four of the targeted processes (all plastic). A database search requested of the Department of Economic Development (DED) revealed another 111 companies with the same SIC codes as the five mentioned above, potentially representing other post-consumer resin users and testing opportunities.

This next phase of the project will accomplish two things. DEM will:

- work with DED and business organizations to identify other RI manufacturers utilizing the targeted processes;
- work with URI to perform on-site assessments at selected companies and test the feasibility of post-consumer substitutes in the five processes that have been identified thus far; and
- attempt to correlate SIC codes with processes to more easily identify the manufacturers that might benefit from this research.

b. EPA Jobs Through Recycling Proposal

The EPA's Jobs Through Recycling initiative was established in 1994 with the goal of stimulating the development of businesses that:

- use recovered materials that would otherwise be landfilled or incinerated; and
- contribute to economic growth and create/retain jobs.

In FY 1995, the EPA had approximately \$1.5 million available to distribute through a competitive process. DEM has received preliminary approval for a project that will bring together the following entities to establish, through requests for proposals and support services, a self-sustaining disassembly center and new material processors for electronics and appliances collected in the Northeast region: the Rhode Island Departments of Environmental Management (DEM) and Economic Development (DED), the American Plastics Council (APC), Citizens Bank, the University of Rhode Island (URI), the Rhode Island Export Assistance (RIEAC) and Small Business Development (SBDC) Centers at Bryant College, and the Northeast Recycling Council (NERC). Although potentially of high value, appliances and electronics are diverse in their design and material content, posing daunting challenges of collection, disassembly and marketing. This project is designed to overcome barriers by developing education and collection strategies; developing databases to aid in disassembly and material identification and in identifying export markets; and by assisting companies in employee training, business planning, operation and financing. Additionally, it will disseminate "design for disassembly/recycling" information learned from the disassembly process. DEM will receive approximately \$236,000 to fund this project pending approval of a work plan by EPA.

c. Recycled Product Procurement

Public Sector

Rhode Island General Law 37-2-76 requires the state to affirmatively promote the use of recycled products. Specifically, with respect to office paper products, at least 50 percent of the expenditures made by the state must be recycled by fiscal year 1995. Furthermore, a timetable is to be established for continued integration of other recycled products into the state's purchases based on research conducted by DEM.

Previously, a five percent price preference was the mechanism used to increase procurement of recycled products. Price preferences were used to bring the cost of recycled products in line with those made from virgin materials. However, the price preference became an administrative burden and was not producing the desired results. Price preferences were eliminated and replaced with RIGL 37-2-76, under which recycling content is established as part of the standard specification for products designated by DEM and DOA.

Several successful efforts to increase recycled product procurement through master price agreements have been made under this new statute. Master Price Agreements (MPA's) are three-year contracts that are entered into by the Office of Purchases for frequently purchased items (i.e. office paper, lumber, asphalt mix). MPA's are often used by government agencies to bid once for frequently purchased items. DEM, in cooperation with the DOA/ Office of Purchases, has developed a timetable for integrating recycled-content products into MPA's where applicable. When an MPA is nearing expiration, DEM researches the availability of recycled-content products associated with that MPA for inclusion when it is re-bid. This has been accomplished for several MPA's, primarily paper products; however, other products will continue to be researched.

Although RIGL 37-2-76 does not apply to municipal governments, DEM decided to include them in the process as they are able purchase from state contracts. DEM developed a *Buy Recycled Guide* for use by state and municipal public sector purchasing agents when searching for information on recycled products. To keep state and municipal purchasing agents abreast of developments, DEM will update the *Guide* semi-annually. The *Guide* was distributed to over 60 state and municipal representatives at a public-sector Buy Recycled Workshop held on October 4, 1994 conducted by DEM and League of Women Voters of West Bay (League). DEM will attempt to monitor the progress of municipalities in buying recycled products; they are currently discussing a program with the League to provide training for volunteers to conduct face-to-face interviews with municipal purchasers.

Businesses

The National Recycling Coalition's Buy Recycled Business Alliance (BRBA) is a national group of companies committed to increasing their purchase of recycled-content products. With resources provided by the BRBA, DEM is conducting an outreach program to business to encourage participation. In April 1994, BRBA paid for training for a DEM representative who in turn promotes the program in Rhode Island. DEM is planning to speak to purchasing associations and Chambers of Commerce in 1995 and also plans an informational mailing to businesses with more than 50 employees.

DEM has also developed a seasonal publication ("Business Brief") which is mailed directly to businesses who report to DEM, to Chambers of Commerce, and others. A regular feature that will profile recycled products will help provide ongoing education on the diversity, use, quality, cost and availability of recycled products.

DEM is also developing a sourcebook of recycled content products manufactured and distributed locally. It will be available to government, businesses and the general public upon request.

DEM provides technical assistance, cost and availability information for recycled products to businesses upon request.

Consumers

Both DEM and the Corporation participated in a Buy Recycled Campaign organized by the Environmental Defense Fund (EDF). EDF and the Ad Council, with input from states, developed television, radio and print public service announcements promoting the purchase of recycled products. Unfortunately, the public service announcements were not widely seen and more work needs to be done in this area.

DEM has teamed with the National Recycling Coalition on a "Come Full Circle Campaign," a multi-media consumer-awareness campaign. The primary goal of this initiative will be to encourage consumer demand for recycled products and packaging through an educational and informational incentive campaign. The campaign is scheduled to kick off on April 7, 1995 and television ads will run for six weeks on the Turner Network.

c. Newspaper Minimum Content

In 1990, the Northeast Recycling Council (NERC) expanded markets for recycled newsprint by securing agreements with newspaper publishers to phase in increasing amounts of recycled content by the year 2000 and by pushing for related legislation in member states. In 1991, Rhode Island General Law 28-18.16 provided a direct mechanism for improving markets for old newspapers by establishing a timetable for publishers to purchase increasing percentages of post-consumer content newsprint. The rates and dates are as follows:

- 11% by January 1, 1993
- 22% by 1996
- 31% by 1998
- 40% by the year 2001.

Publishers are required to report the previous year's recycled newsprint purchases to DEM on an annual basis. Reports received in 1994 revealed that Rhode Island publishers are exceeding the current minimum content requirement of 11 percent. Nine publishers are reporting post-consumer content usage which meets or exceeds the 1996 requirement of 22 percent.

The Rules and Regulations for Newspaper Recyclability were filed with the Secretary of State September 24, 1994. They were developed after meeting several times with the state's newspaper publishers. This, and similar efforts in other New England states, have spawned construction of several new de-inking facilities and the demand for old newspaper has increased substantially. It is widely believed that the demand for old newspaper, as well as other paper grades, will remain high for the foreseeable future.

d. Product/Package Labeling

Rhode Island General Law 28-18.8-3 authorized DEM to promulgate regulations which established official emblems for use on products and packages to disclose their recycled content, reusability, recyclability or information on how the item was source reduced. Many surveys have indicated that a substantial portion of the population is influenced by "green" labeling. The intent of RIGL 28-18.8-3 is to preclude false claims that may entice a consumer to purchase one item over another. It is considered a recycling market development tool as the *Recycling Emblem Regulations*, which were filed in October 1990, set a high standard of compliance.

Rhode Island is one of only a few states that have a recycling emblem law and it is widely regarded as the most stringent. Having different laws in each state is cumbersome for businesses operating nationwide, so there is support for a federal labeling law. The Environmental Protection Agency, however, has chosen not to pursue a national labeling standard at this time. The Federal Trade Commission (FTC), however, has established a set of guidelines for the use of Environmental Marketing Claims under which recycling emblems are covered. The FTC Guidelines do not require disclosure of post-consumer content when using recycling emblems and, therefore, are not as stringent as Rhode Island's regulations. The FTC has won several court settlements against companies making false environmental claims. FTC's Guidelines will be reviewed in the summer of 1995.

The Northeast Recycling Council (NERC) has recently revisited this issue in an attempt to reach consensus on a common standard for member states that is consistent with other policies. With the goal of the establishment of a federal standard in mind, NERC has decided to lobby the FTC with the goal of adding post-consumer content disclosure.

Stringent enforcement of the regulations would be very resource intensive. Current enforcement practices rely on notification by staff and the general public of incorrect use of labels and emblems. As labeling requirements become more standardized across the country, enforcement may eventually become a non-issue.

e. Northeast Recycling Council

To expand regional markets for recyclable materials and to develop markets for products made with recyclable content, DEM and Corporation both participate in regional market development efforts conducted by the Northeast Recycling Council (NERC). NERC's first large-scale project was a regional approach to buying recycled paper in 1989 that resulted in the standardization of state definitions and specifications for recycled paper. NERC is committed to addressing both supply and demand issues for many materials and has cultivated relationships with several industry associations for mutual education and problem solving.

f. Waste-based Manufacturing Partnership

In 1993 and 1994, a legislative study commission met regularly to discuss opportunities and barriers to increasing waste-based manufacturing in Rhode Island. Various interests were represented, including business and labor groups, public-interest/environmental organizations, elected officials, and the Departments of Economic Development and Environmental Management.

Following this effort, the Rhode Island chapter of the Clean Water Fund organized a public forum on economic development through recycling. This forum assisted in the development of an informal partnership amongst several interested parties who intend to increase activity in this relatively unexplored area. The Clean Water Fund has received funding to develop a formal partnership amongst the many interests around this issue. The partnership will be responsible for working jointly to create a market-development/economic opportunity strategy plan designed to create economic opportunities in the private sector while utilizing more locally-generated recyclable and reusable materials. The goal is to link these opportunities to neighborhood-based community development and redevelopment so that the benefit derived from using recyclables may be realized locally. Other benefits to the partnership approach include the following: (1) partners will work together to clarify opportunities and problems; (2) a joint scope of services for the market-development plan will be developed to reflect the mutual needs and concerns of all participants; (3) active involvement in the plan's development will ensure mutual support for the final plan; (4) an alliance will have been formed that can help ensure implementation of the plan's recommendations upon its completion.

g. Other

Local Recycling Markets List: DEM maintains and distributes a list of businesses throughout the region that accept a variety of materials, including those on the mandatory recycling list. DEM plans to increase the level of detail provided by 1996.

Recycled Products Sourcebook: As mentioned previously, DEM is preparing a sourcebook of recycled products available in the state and region. This book is intended to increase the users' awareness of the variety and availability of recycled products and answer the often asked question of "Where do I find recycled products?"

h. Findings

- DEM has taken a leading role in recycling market development and should maintain the lead, but is hampered by lack of staff and funding.

- Remanufacturing research can enhance profitability and sustainability of Rhode Island businesses, build recycling markets and in some cases attract recycling related business to the state.
- The Departments of Environmental Management and Administration are well on their way to incorporating recycled content products into the state's purchasing system. This information is being transferred to, and used by, municipalities and businesses. Municipalities have already received information through the "Buy Recycled Workshop."
- Efforts such as the Northeast Recycling Council's targeting consumer awareness of recycled products must be increased.
- Newspaper publishers are meeting or exceeding their purchasing requirements under the Newspaper Recyclability Statute (minimum content legislation).
- Recycling market development activities are resource intensive.
- A jointly-developed recycling market development/economic opportunity strategy plan would assist the state in developing and implementing programs to utilize recyclables in local businesses and/or neighborhood-based development projects.

i. Recommendations

- DEM and URI should continue remanufacturing research and devise a technology transfer strategy and explore funding opportunities.
- DEM should promote recycled product procurement by state agencies and quasi-state agencies that do not use the state's purchasing system extensively.
- DEM should focus future efforts regarding use of recycling emblems on influencing a national standard through NERC.
- DEM needs more funding to properly implement market development programs.
- DEM and the Corporation should continue involvement in regional market development efforts through NERC.

- The Corporation and DEM should continue to participate in the partnership being coordinated by Clean Water Fund to join government agencies, business groups and financial institutions, community groups, and environmental groups for the purposes of producing a market development/economic opportunity strategy plan.

6-3-7 Leaf and Yard Waste Composting

a. Introduction/Nature of the Material

Composting is the controlled, aerobic (in the presence of oxygen) degradation of organic materials. Compost is a humus-like soil amendment which improves soil porosity and aids in water and nutrient retention. Much of the municipal waste stream is readily compostable. The Corporation's Waste Composition Study estimates that yard waste, including leaves, grass clippings, weeds, and brush and tree prunings, constitutes 13.5 percent of the municipal waste stream. (This estimate may be low because many municipalities manage their leaves locally and thus are not accounted for in the Corporation's Waste Composition Study.) Composting this material will have a far less detrimental effect on the environment than landfilling or incinerating and will yield a useful product. The removal of yard waste from the waste stream can: a) preserve disposal capacity; b) reduce disposal costs; and c) generate a useful soil amendment.

Leaves are light in weight and relatively easy to compost. Carefully managed leaf compost operations produce a finished, stable product in twelve months or less. Other yard wastes can be composted as well, but may require more time and careful management. Bushes and branches must be chipped or shredded before being added to compost, because their tough, woody structure and relatively low amount of nitrogen cause them to decompose slowly. Grass clippings are high in nitrogen and speed up the decomposition of leaves. Grass clippings must be carefully managed to control odor and runoff.

b. Federal and State Regulations

1. Federal Regulation

There are no federal statutes or regulations that affect the operation of leaf and yard waste composting operations.

2. State Regulation

Early in 1995, under the authority of the Soil Amendment Law, DEM's Division of Waste Management developed compost facility regulations to be added to the Rules and Regulations for Solid Waste Management Facilities.

Siting and operational standards for four categories of composting facilities are addressed in the draft Regulations. These are: (1) leaf and yard waste composting; (2) putrescible waste composting; (3) mixed solid waste composting; and (4) agricultural composting.

Leaf and yard waste and putrescible waste composting facilities will be required to register with DEM's Division of Waste Management. Agricultural composting operations will register with the Division of Agriculture. A license will be required for construction and operation of mixed solid waste composting facilities. The regulations are expected to be adopted in fall 1995.

c. Current Management Practices

1. Large Scale Composting Operations

Since 1989, DEM and the Corporation have focused their efforts on providing grant funding, technical assistance and coordinating several demonstration and model composting projects. The goal of these projects has been to develop effective strategies for collecting and composting leaf and yard waste, learning by experience the best methods to use, and to serve as model programs that could be easily duplicated in other municipalities.

In 1989, Charlestown and North Kingstown established model leaf composting projects with funding and technical assistance from DEM and the Corporation. The communities each received grants of \$25,000 and assistance with site design, employee training, data collection, trouble-shooting, and public education. The Corporation funded a technical consultant to work with the towns.

In these model programs, residents delivered leaves to centralized drop-off sites. The sites composted using windrow and turn technology: the leaves are watered, placed in long piles, monitored for temperature and moisture, and turned with front-end loaders. The windrow and turn technology is designed to be readily replicable, expandable and simple and inexpensive to operate. The equipment used is common to most public works departments. The programs and procedures used were designed by the Corporation's technical consultant.

In 1990, the focus of the program was directed to curbside collection of leaf and yard waste. A \$40,000 technical assistance grant was awarded to Coventry by the Corporation and DEM to implement a model curbside leaf and yard waste program using paper bags for leaf collection. Again, the program was designed by the corporation's technical consultant. Coventry adopted an ordinance requiring leaves to be separated from solid waste and set out in special paper bags or reusable barrels for curbside collection and delivery to the composting site. Plastic bags were banned from use in the program.

A number of education components have been developed by the Corporation and DEM based on the experiences of the model communities. These include:

- a) "A Yard Waste Compost Guide for Rhode Island Communities," a comprehensive guide to planning and implementing a municipal compost program, which provides guidance on establishing municipal-scale composting operations;
- b) Operation Manuals for the North Kingstown and Charlestown Projects for use by other Rhode Island communities and businesses that wish to compost yard waste;
- c) A report on the potential end-uses and markets for finished leaf and yard waste compost;
- d) A report on methods of collecting leaves and yard wastes; and
- e) Training Seminars: two seminars are offered by DEM and the Corporation each year: one for planners in early winter and one for site operators in early fall.

Video tapes of the training seminars are also available.

The model programs, along with encouragement from DEM and the Corporation, have facilitated the development of municipal and private composting projects. By 1995, 29 municipalities, including the major population centers of

Providence, Pawtucket, East Providence and Warwick, offered some form of composting program to their residents.

To assist municipalities that have been unable to site composting facilities locally, the Corporation opened a windrow and turn composting operation adjacent to the Landfill. This site accepts commercial or municipal leaf and yard wastes delivered in bulk or in paper bags.

2. Backyard Composting Program

Both DEM and the Corporation promote backyard composting as a way to divert waste from disposal facilities. DEM has published pamphlets on backyard composting since 1985. DEM promotes backyard composting through newspaper and radio advertising. DEM also developed a how-to video which is available to residents in local libraries and at major video outlets throughout the state. In 1993, DEM commissioned Brown University to conduct a study on the perceptions of backyard composting in East Providence. The survey data indicated that the target audience for the educational program should be those who identify themselves as being likely to compost, gardeners, and children, and that the initial focus should be on grass-cycling. DEM provided funding to the City of Pawtucket to implement a citywide backyard composting program. The city made composting bins available to residents at a reduced rate. Results were not available at the time of this writing.

In 1993, DEM also developed a public education campaign to keep grass clippings out of the waste stream. The "Don't Trash Grass" program encourages residents to leave grass clippings on the lawn which results in substantially reduced disposal needs and healthier lawns that require less fertilizer and less water. The program includes how-to brochures and videos for residents, a community guide book for municipal officials and newspaper and radio advertisements.

In 1991, the Corporation provided commercially available bins to two environmental organizations, the Southside Community Land Trust and Brown University's Urban Environmental Lab, for informal evaluation and testing. Since then, the Corporation has promoted the availability of various commercial bins and other equipment at wholesale cost to Rhode Island residents. Demonstration events are held regularly and composting educational brochures are distributed in large numbers to interested residents.

The Corporation worked with the University of Rhode Island (URI) Cooperative Extension program on a number of projects designed to promote composting of yard waste and kitchen scraps in the backyard. A Master Composter training program was conducted in 1991 to teach recycling coordinators and volunteers to implement and promote backyard composting in their communities. Educational projects implemented as part of the program included establishing compost demonstration sites, conducting backyard composting seminars, initiating worm composting projects and working with school-aged children to set up compost operations.

Various educational projects on backyard composting are being tested in conjunction with school recycling programs. A traveling worm-bin composting exhibit has been developed and is used in school presentations. Several schools are experimenting with composting all or some of their organic wastes. Resource materials on composting, including provision of free bins in some cases, are made available by the Corporation for teachers interested in pursuing compost education programs. One private firm in the state manages a worm farm, sells both worms and worm composting bins and, with the assistance of EPA grants, provides worm composting curricula and bins to classrooms throughout Rhode Island.

d. Future Management Practices

Given projected increases in tipping fees and a projected ban on landfill disposal, it is anticipated that all residential leaf and yard waste will be composted either locally or regionally within the next several years. With a growth in demand for facilities, all sites will likely expand operations. Finally, sludge compost facilities are being explored as potential users of yard wastes.

The Corporation will continue its effort to identify the most effective approaches to implementing backyard composting and to estimate the per/ton cost of managing waste in this manner.

e. Findings

- Composting leaf and yard waste diverts material from disposal in landfills; it also creates a useful end-product that can substitute for expensive topsoil and other soil products.
- Because leaves are lightweight yet bulky, transporting them great distances is expensive and should be kept to a minimum. By utilizing a local site, communities can benefit from avoided disposal and transportation costs, as well as from production of a soil amendment for use by municipal departments and residents. Not every community has an adequate site, staff, or equipment for a compost operation. Therefore, cooperative ventures with neighboring communities, private businesses, or a state-run, regional compost project, will be necessary.
- The extensive monitoring and data analysis of the model programs will not only assist the host towns in instituting efficient leaf drop-off and/or collection over the long term, it will also help other communities throughout the state to predict costs and the success of their own programs.
- User fees can increase participation in both backyard and municipal composting programs.

f. Recommendations

- The 1989 and 1990 model programs should be used as a guide for a state-wide leaf and yard waste compost plan. Communities that lack proper sites for compost operations should be encouraged to form cooperative ventures with neighboring communities, private farms, landscapers, or use the state Landfill site.
- Leaves should be banned from all landfills and placed in proper composting operations. Initially, this ban should not yet include other yard wastes such as brush and grass, which require more intensive management than leaves as well as space and operational experience not yet available in composting operations.
- The ban should be expanded such that all yard wastes are composted.
- The Corporation should improve and expand its leaf and yard waste composting facility to serve additional municipalities and to compost additional materials, such as grass and wood trimmings.
- Backyard composting should be given priority in the solid waste management system because it eliminates the need for transportation of leaf and yard waste and promotes the composting of other organic materials, such as food scraps, for which an effective large-scale composting method has not been developed.
- The experiences of the Corporation and DEM sponsored backyard composting programs should be used as the basis for implementing backyard composting, wherever possible, statewide.

6-3-8 Food Waste Management

a. Introduction

Food waste comprises approximately 15-25% of the residential waste stream, up to 90% of the food service industry waste stream, and significant portions of other industrial, commercial and institutional waste streams. However, food waste has not yet been targeted for large-scale composting in Rhode Island. To date, the only efforts to promote food composting in the state have focussed on small-scale, backyard composting of yard and food waste and limited vermicomposting (described in Section 6-3-7). The next step in diverting materials and maximizing the recovery of resources is to establish effective programs to compost food waste generated by residents, businesses and institutions.

b. Residential

1. Backyard Composting

The Corporation and DEM have both undertaken small-scale efforts to encourage backyard composting; the Corporation has sold compost bins to over 2,500 residents at wholesale cost and donated several to non-profit organizations. Both DEM and the Corporation have been actively promoting backyard composting as a waste reduction technique. However, no analysis has been done in Rhode Island to evaluate the long-term benefits of maximizing this technique by providing significantly subsidized equipment and intensive education on a large scale. In fiscal year 1996, the Corporation has budgeted funds to provide 500 bins to residents at a subsidized rate of \$15 (versus the wholesale cost of \$50). Intensive education will accompany distribution of these bins and follow-up surveys and waste composition analyses will be conducted to measure the effectiveness of this approach in significantly reducing the residential waste stream.

A study conducted in the town of Port Colborne, Ontario indicates that, with intensive education and installation of free composting bins, on-site composting of residential food waste can be very successful and economically justifiable. In communities like Port Colborne, this approach may be preferable to curbside collection due to the high economic and environmental costs of collection. Another benefit of requiring on-site composting is that it places the responsibility of waste management on the generator of the food waste.

2. Curbside Collection

Single-Family Units

No Rhode Island communities have yet experimented with food waste collection at the curb. Curbside collection of residential food waste (or any other material) is labor-intensive and expensive. As a result, many communities may not be able to provide such a service. The municipality of Robinson, Illinois conducted a four-week pilot project in which food waste was collected from 35 single-family households. An average of 21% of the waste stream was collected over the four-week period. Surveys administered to both participating and non-participating residents indicated that 42% of residents would be willing to participate in a future food waste collection program if the service was provided for free, but only 5.6% would participate if there was an additional charge.

The community of Markham, Ontario implemented a comprehensive recycling program in April 1994 that included both curbside collection of organics and promotion of backyard composting. In the first month of the program, a total of 36% of the waste stream was composted either by backyard composters or as part of the curbside collection.

Multi-Family Units

Some communities have experimented with food waste collection in apartment buildings. In the Park Slope section of New York City, a food-waste collection program has been in operation since 1990. This program diverts approximately 6% of the residential waste stream.

c. Commercial/Institutional

1. On-Site Composting

According to a survey conducted in early 1995, an increasing number of universities, prisons and other institutions across the country are implementing their own on-site composting programs. To date, however, this is only occurring on a very limited basis in Rhode Island. Composting organics from commercial and industrial sources is often cost-effective, since food waste frequently comprises a large percentage of the total waste generated, some soiled papers such as napkins, paper towels, and food packaging can be composted as well, and composting can be cheaper than other options. In 1993, DEM provided a grant to Amos House in Providence to build a greenhouse for vermicomposting beds for composting food waste generated by this shelter.

DEM funded construction of a vermicomposting greenhouse to compost food scraps from Amos House following development of the project by a team from Southside Community Land Trust, Amos House, Beaver River Associates, and the Corporation.

2. Curbside Collection

In early 1995, a survey of composting facilities which accept food waste from grocery stores and food service industries showed an increasing trend toward source separation of food waste. The collection of food waste from businesses and institutions, such as grocery stores, restaurants and cafeterias, is generally much easier and cheaper than collection from residential areas. However, many businesses that separate food waste report contamination problems. Several studies have been conducted in which all of the food waste generated by municipalities, businesses and industries in a given community was targeted for recovery.

d. Findings

- Composting food waste can divert large quantities of material from disposal in landfills; it also creates a useful end product.
- Numerous food waste pilot projects with various collection strategies have been conducted throughout North America. Currently, Ontario is taking the lead in examining the cost-effectiveness of alternative collection strategies and the compatibility of curbside collection of food with backyard composting.
- Food waste composting is in the experimental stages and is a very site-specific operation; on-site composting may work well in some Rhode Island communities, institutions and businesses but may not be appropriate in others.
- The implementation of user-fee programs can increase participation in food waste composting.

e. Recommendations

- The Corporation and DEM should further research strategies for effectively composting food waste and conduct cost-benefit analyses of curbside collection of food waste and promotion of on-site food waste composting in both the public and private sectors.
- Analyses of food waste composting options should include: (1) an examination of the potential for working with local farmers and/or composters to compost food waste at existing facilities, and (2) an assessment of the need to construct additional composting facilities to manage food waste.
- The Corporation should develop a grants program for pilot composting projects in municipalities, businesses (such as supermarkets and restaurants) and institutions (such as schools, nursing homes, prisons, etc.). Grant monies should be provided to produce educational materials and provide composting equipment.
- As expanded recycling is implemented, alternative collection strategies that include food waste should be considered.

6-3-9 Materials Recovery Facility (MRF)

a. Introduction

The state's Materials Recovery Facility (MRF) is located in Johnston, Rhode Island adjacent to the Landfill which is owned and operated by RISWMC.

The MRF is owned by RISWMC and operated by New England CRInc. under contract to the Corporation. It began commercial operation in May of 1989. The building was constructed and equipped at an initial cost of \$6.25 million. The MRF was designed to receive 80 tons of mixed bottles/cans recyclables and 60 tons of newsprint per day from about half of the state. A one-shift-per-day operation was envisioned.

By the end of 1991, the facility was processing approximately 190 tons per day (TPD) of material: 108 TPD of newsprint and 82 TPD of mixed bottles/cans recyclables and operating at 135 percent above the rated capacity. This required RISWMC to undertake a major retrofit of the facility to increase the capacity of the facility so that additional cities and towns could join the state's mandatory recycling program. This retrofit was completed in September 1992 at cost of \$589,000 and gave RISWMC the ability to serve the needs of the state's mandatory municipal recycling program with one facility.

As of 1995, the MRF separates, processes, and markets aluminum, tin/steel cans, two types of plastic (translucent HDPE and PET), glass in three colors (flint, amber and green), newspaper and limited amounts of school/office paper, kraft paper and corrugated cardboard. The existing facility consists of a 40,000 square foot, steel-framed building containing a tipping floor and series of conveyor belts and mechanical equipment to separate and process recyclable materials.

In the spring of 1995, construction will begin for expanding the MRF to process additional materials. The expansion will allow the cities and towns to increase the amount recycled from the present 12 to 18 percent to 40 percent by weight of the municipal waste stream. Plans call for the expansion of the building to process: additional grades of waste paper (office and residential mixed paper, mail, old magazines (OMG), corrugated cardboard (OCC), chipboard, kraft paper, telephone directories (OTD) and textiles); and additional mixed recyclables including additional plastic containers (custom PET and pigmented HDPE bottles), scrap metals, wood, empty aerosol and paint cans, and poly-coated milk cartons and drink boxes. In addition, flexibility has been incorporated into the design of the expanded process system to give RISWMC the ability to handle tires and other future recyclables, such as more grades of plastics.

Also as a part of the expansion, RISWMC plans to make improvements to the existing facility by: installing climate-controlled enclosures for the sorting staff; installing a separating wall between the tipping floor and the processing area; repairing the tipping floor; installing a new drainage system; upgrading the mechanical, electrical and fire protection systems; and installing a mixed broken glass recovery system that will sort glass half-inch and larger by color. The mixed broken glass recovery system will: reduce the residue on the mixed bottles and cans recyclables line to less than six percent; reduce the amount of residue presently going to the landfill; and increase the amount of marketed materials and thus enhance the revenue structure.

b. State Regulation

The operation of RISWMC's MRF is conducted pursuant to its solid waste management facility license.

c. Separation and Processing

Existing Facility: 1995

The existing facility is designed to receive and handle 160 TPD newsprint and 140 TPD of mixed recyclables. In 1995, it served 90 percent of the state's residents. At the end of 1994, the facility processed 237 TPD of material: 137 tons of newspaper and 100 tons of mixed recyclables. To process current tonnage, three shifts are necessary three days per week for newspaper, and two shifts four to five days per week for mixed recyclables. One process train handles newspaper, while a second handles the commingled materials. Quantities of materials handled since commercial operation began in 1989 are:

Material Processed By MRF

<u>MATERIAL</u> <u>(in tons)</u>	<u>1989</u>	<u>1990</u>	<u>1991</u>	<u>1992</u>	<u>1993</u>	<u>1994</u>
Aluminum	376	804	858	704	747	859
Tin/Steel Cans	1,435	2,835	3,145	3,148	3,456	3,990
HDPE 334	975	881	680	914	1,209	
PET 495	803	1,046	1,210	1,152	1,176	
Flint glass	1,820	4,531	4,712	4,305	4,464	4,964
Emerald glass	838	2,023	2,411	2,401	2,756	3,535
Amber glass	672	1,548	1,726	1,417	1,471	1,880
Newspaper	20,064	26,398	26,620	29,675	31,858	35,454
OCC 65	150	46	135	0	2	
Kraft 42	0	0	43	177	148	
Office Paper	0	0	0	0	0	85
Residue*	4,254	6,643	6,668	7,370	7,036	8,231
TOTAL	30,385	46,710	48,113	51,088	54,031	61,533

*Greater than 90 percent of the process residue consists of broken glass less than 2 inches in size. The remaining residue is non-recyclable materials. The expanded facility upgrades should address this problem and reduce the amount of residue going to the landfill to less than six percent.

Truckloads of recyclable materials (divided into two compartments: one for newsprint and the other for all other materials "mixed") are tipped on the floor of the MRF in two piles, one for newsprint and one for mixed containers. The load is then inspected for contaminants and is refused if it contains more than ten percent refuse and non-recyclable materials. The MRF operator may charge to reload a truck.

Newspaper Process Description: In order to produce a high grade of baled newspaper, the process line handles approximately seven to eight tons per hour. (Faster processing is possible, but a lower, less marketable grade is produced.)

Prior to processing, newspaper is stockpiled in a receiving area, from which a skid loader pushes it into a conveyor pit leading to the paper baler. Two workers pull kraft bags and contaminants from the conveyor before the paper enters the baler chamber. The Bollegraaf paper sorting system is a non-shred, high-density machine equipped with an automatic wire-tie system. Baled material is stacked or loaded directly (via forklift) into sea/land containers. Kraft bags are subsequently batch processed.

Commingled Recyclables Process Description: The process line operates at approximately eight tons per hour. Commingled recyclables are also stockpiled, prior to processing, in the designated receiving area, from which a front-end loader pushes them into a conveyor pit. Two control-rod sensors control the dispensation of materials from the feedstock conveyor onto an inclined conveyor and thereby create an even burden depth of material.

One worker culls non-recyclable materials as well as large aluminum foil products from the conveyor line. Tin/steel is removed from the recyclables by an overhead electro-magnet; broken glass is screened out by a vibrating screener; glass is separated from plastics and aluminum by the Inclined Sorting Machine, where chain screens sweep the lighter materials off to the side while allowing the glass to pass through and down the incline onto a sorting conveyor; glass is color sorted manually. Aluminum is separated from the plastics by an eddy current magnet, and plastics are manually sorted into resin types.

After separation, mixed recyclables are processed in the following manner:

Tin/Steel Cans	flattened and baled
Glass	crushed/culletized
Aluminum	flattened and baled (manual tie)
PET	perforated and baled
HDPE	perforated and baled

Expanded Facility (To begin operation in 1996)

The Expanded Facility will enable the MRF to increase its capacity up to 360 tons-per-day of mixed wastepaper processing and 220 tons-per-day of mixed containers/scrap. An extension will be placed on the north side of the building which will house a two-conveyor paper-sorting system and the mixed containers processing area will be expanded within the existing structure (in the area freed by the removal of the existing paper-sorting system).

d. Marketing

The MRF operator markets processed materials and ensures a steady, large supply of high-quality materials for markets. Revenues from these materials are used to offset the costs of operating the MRF and the recycling programs. In 1994, the MRF's net operating cost averaged \$3.18 per ton.

e. Findings

- After five years of operation, the MRF remains one of the most reliable suppliers of recycled materials and constantly gets the highest price for its recycled materials.
- The technology has proven to be reliable, the machinery durable and the concept of blending mechanical and manual separation efficient.
- In 1995, the facility processed over 210 tons per day of material collected from approximately 90 percent of the state's eligible households.
- The present materials recycled at the MRF represent approximately 12-18 percent by weight of the waste generated by the communities participating in the program.
- The MRF marketed 4,260 tons of material each month in 1995.
- Markets for materials are constantly fluctuating, making it difficult to stabilize the net cost of operating the facility.
- Because markets are cyclical and the range of materials that is recyclable includes many low-value materials, the state needs to continue to provide a long-term repository for mixed residential recyclables for RI's municipalities.

f. Recommendations

- Expand the MRF as part of an effort to achieve the state's 70 percent recycling goal. The expansion must give the state the capability to process: additional grades of waste paper: office and residential mixed paper, mail, old magazines (OMG), corrugated cardboard (OCC), chipboard, kraft paper, telephone directories (OTD) and textiles; and additional mixed recyclables including additional plastics containers (custom PET and pigmented HDPE bottles), scrap metal, wood, empty aerosol and paint cans, and poly-coated milk cartons and drink boxes. Further, expansion plans should build in future flexibility such that additional materials deemed recyclable by DEM may be processed.
- As a part of the MRF expansion, the Corporation should make improvements to the existing facility such as: climate-controlled enclosures for the sorting staff; installing a separating wall between the tipping floor and the processing area; repairing the floor; installing a new drainage system; upgrading the mechanical, electrical and fire protection systems and improve the general housekeeping of the facility.
- Reduce the amount of MRF residue going to the landfill by installing a mixed broken glass recovery system that will sort glass half-inch and larger by color and collect all other glass for mixed glass aggregate markets.
- Expand the educational tour area to handle larger groups in a secure and safe setting in order to provide a profound educational experience that will encourage source reduction and recycling behaviors by school children and adults.
- Secure long-term market contracts for materials in order to stabilize revenue.
- Continue RISWMC involvement in processing expanded materials to ensure a long-term repository for recyclable materials to support the recycling efforts of Rhode Island's municipalities.

6-4 LANDFILL

6-4-1 Introduction

Although landfilling is the lowest priority for solid waste management, nearly all of the solid waste currently generated in

Rhode Island is still disposed of by landfilling.

Substantial progress has been made in the nineties toward more intensive utilization of those solid waste management options higher on the federal-state management hierarchy than landfilling. Over the past five years, the percentage of Rhode Island solid waste that has been landfilled has gradually but steadily diminished as a result of the steady increase in the percentage of the waste stream that has been diverted from ultimate disposal and recovered for recycling.

All existing and new sanitary landfills must now meet stringent environmental protection standards established by the federal Resource Conservation and Recovery Act and by the Department of Environmental Management.

6-4-2 Background

For the past 25 years, landfilling has been the predominant method of solid waste management in Rhode Island. In 1970 there were 44 land disposal sites in Rhode Island, most of which were open burning dumps. With the advent of public concern over air pollution and passage of the Clean Air Act, open burning was banned, and communities turned to sanitary landfills to bury increasing quantities of waste. As these small local landfills gradually closed, cities and towns began to look outside their borders for disposal options. Consequently, by the late 1970's, 19 of Rhode Island's 39 communities were transporting their refuse to one facility: the Central Landfill in Johnston.

In December 1980, the Corporation purchased the Central Landfill, which had a footprint of 121 acres licensed to accept solid waste, for \$10 million to serve Rhode Island's disposal needs until an integrated system of solid waste management programs and facilities could be established.

6-4-3 Municipal Landfills

There were three municipal landfills in the State in 1996. These landfills served the towns of Bristol, Charlestown and Tiverton. The lifespans of these three landfills varies from approximately one year for the Bristol facility to about 20 years for the Tiverton landfill. These estimates, obtained from town officials, are very rough. Upon closure of their landfills, these towns are mandated by law to enter the Corporation's system.

6-4-4 Privately-Owned Landfills

There are no operating or proposed private sanitary landfills in Rhode Island for mixed solid waste and none are planned. It has been 11 years since the last privately-owned solid waste sanitary landfills closed in Rhode Island: The Capuano Landfill in Cranston and the L&RR Landfill in North Smithfield both closed in 1985.

There is, however, a licensed construction and demolition (C&D) debris landfill owned and operated by Hometown Properties in North Kingstown. In 1986, a C&D landfill was proposed in Richmond. Permitting delayed the proposal for years; it is not likely to be developed.

6-4-5 Out-of-State Facilities

Portsmouth and Middletown were the last municipalities to dispose of their solid waste out of state. When their contracts with the BFI landfill in Fall River, Mass. expired in June 1994, these towns began using the State Landfill.

The market for out-of-state solid waste disposal capacity in the region went through a remarkable turnabout in 1994: During the late 1980s and early 1990s, 30 to 35 percent of Rhode Island's waste stream had flowed out of state to facilities with excess disposal capacity, the prices of which had been depressed well below the \$30 per ton level by the economic recession and recycling. Then in June 1994, most or all of that waste once again began flowing to the State Landfill as the availability of out of state disposal capacity tightened and prices went up.

The near-term outlook for the availability of out-of-state solid waste disposal capacity is bleak. The Attleboro landfill, which served regional commercial waste haulers, closed in 1994. The Laidlaw Landfill in nearby Plainville, Massachusetts, has reduced its operations from a permitted 2,500 tons per day to about 900 tons per day in order to stretch

a very limited and rapidly diminishing capacity. As of June 1996, the North Attleboro landfill was nearing closure. New disposal capacity is not being scheduled in the region.

In 1993, the Corporation solicited bids from trash haulers to ship municipal waste out-of-state in order to save Landfill space. However, the bids were too high relative to the municipal tipping fee to make that project economically feasible. If favorable pricing is available, the Corporation believes that shipping limited quantities of waste out-of-state is an effective way to extend the life of the Landfill. However, reliance upon the uncertainties of the out-of-state landfill or incinerator capacity markets for the disposal of large quantities of waste would be risky, both with respect to pricing and availability.

It is prudent planning for Rhode Island to be self-sufficient regarding solid waste management and to continue to develop its own facilities to recycle and dispose of the solid waste that its people and businesses generate.

The least controversial and most environmentally acceptable method of creating landfill disposal capacity adequate to serve Rhode Island is by source reduction, and aggressive recycling and composting. The Corporation and DEM are committed to achieving these objectives and this commitment is reflected in this Comprehensive Plan.

6-4-6 The Current Role of Landfilling

In 1990, an estimated 160,000 tons of municipal and commercial waste were recycled, leaving an estimated 790,000 tons to be disposed of, either: 1) by landfilling within the State of Rhode Island at the Central Landfill or at one of the six municipal landfills operating at that time; or, 2) by disposal at incinerators or landfills out of state.

By 1994, the generation of solid waste in Rhode Island had increased by 12.3 percent from the 1990 estimated level of 950,185 tons to an estimated 1,067,366 tons but recycling had increased by 66 percent to an estimated 266,000 tons. Stated differently, the percentage of the waste stream diverted from disposal to recycling increased from 16.8 percent to 24.9 percent between 1990 and 1994.

As remarkable as the advances made by recycling have been in Rhode Island over the past five years, and notwithstanding the fact that landfilling is the solid waste management option of lowest priority, the importance of landfilling and specifically of the State Landfill to the State's integrated waste management system in the 1990's cannot be overstated.

The importance of the State Landfill to Rhode Island can be dramatically illustrated: In 1990, the Landfill disposed of 424,000 tons of solid waste for 31 cities and towns; there were six municipal landfills operating then and Portsmouth and Middletown brought their waste to the Fall River landfill. In 1994, the Landfill disposed of 393,000 tons of waste for 36 municipalities (the MRF handled 57,000 tons of recyclables). Only Bristol, Charlestown and Tiverton continued to operate their own landfills. In 1995, as in 1990, the State Landfill served as the only disposal site for the municipalities using it. In other words, the facility disposed of about 96 percent of the municipal solid waste generated in Rhode Island in 1995 that was sent to ultimate disposal.

The State Landfill has been the linchpin of the Rhode Island system for years and it is apparent that it will continue in this role through the 1990s. It is a principal objective of the Corporation, as expressed in this Comprehensive Plan, to reduce Rhode Island's dependence on the Landfill (on any landfill, for that matter), and to ultimately alter the role played by the Landfill from lead facility to that of a back-up.

6-4-7 Brief Description of the State Landfill

The State Landfill is located on a parcel of about 1,100 acres on Shun Pike in western Johnston. For the first 13 years of Corporation ownership, disposal operations were confined to a 121-acre section of the 154-acre licensed footprint known as the Central Landfill, an unlined facility that had been used for waste disposal since the late 1960s. Before the original facility was closed in June 1993, the Corporation used it to dispose of about 11 million tons of solid waste. The previous owner disposed of an estimated five million tons of waste in the original Central Landfill.

In June 1993, disposal operations were transferred to the first of two 12-acre and one 10-acre cells within the remaining 34-acre licensed section of the facility on which installation of a double geomembrane and clay liner system had just been completed. Henceforth, all waste would be emplaced in cells with double membrane and clay liners equipped with leachate collection and pretreatment systems. The State landfill is the only landfill in Rhode Island equipped with liner systems that meet all federal standards.

Installation of the liner system on the second 12-acre cell was completed in the fall of 1994 and was approved for disposal of waste by DEM in early 1995. Disposal operations began on this cell in March 1995.

In 1990, the Central Landfill disposed of approximately 700,000 tons of waste including municipal and commercial wastes, demolition debris, municipal and commercial sludge and industrial non-hazardous liquids. In 1991, total waste disposal at the facility dropped to about 600,000 tons as recycling took hold, particularly the recycling of C&D debris, and more and more commercial waste moved to out-of-state disposal facilities. By 1992, total waste disposal increased to nearly 700,000 tons and in 1993 it totalled just above 650,000. In 1994, total waste disposed exceeded 700,000 tons despite the recovery of nearly 60,000 tons of materials for recycling. And in 1995 approximately 780,000 tons of solid waste in all categories were disposed of in the Landfill with more than 65,000 tons of materials extracted from the waste stream for recycling.

The Corporation estimates that the disposal of all categories of solid waste in the Landfill will stabilize at an annual average of approximately 750,000 tons for the period 1996 through 2000. At a loading rate of 750,000 tons of solid waste annually, the existing licensed facility, known as Landfill Phases II and III, has 5.09 years of life remaining as of June 1996.

Daily traffic into the existing facility includes 550 to 750 trucks hauling solid waste, recyclables and materials for use at the landfill, and 150 to 200 vehicles for employees, deliveries, etc. Access is via Interstate 295 and Plainfield Pike, a two-lane state highway, and the industrial access routes of Greenhill Road and Shun Pike. Operating hours are from 6:00 a.m. to 3:30 p.m. daily.

6-4-8 The Southwest Landfill

In January 1994, the Corporation applied to the DEM for licensure of the Southwest Landfill which would have a footprint of 45 acres abutting the southern perimeter of the existing Landfill. If permitted as proposed, the Southwest Landfill would have 5.7 million cubic yards of capacity and would provide an additional 5.7 years of disposal at the current average Landfill loading rate of about 750,000 tons of solid waste annually; this is a conservative approach to the calculation of Landfill life because aggressive recycling will certainly reduce the quantity of waste delivered to ultimate disposal over the next 20 years.

6-4-9 State Planning Council Landfill Site Certification

The Southwest Landfill is on the site certified for the purposes of solid waste landfill siting by the State Planning Council on June 28, 1993. As stipulated by the State Planning Council Site Certification document, the Southwest Landfill will be built with a "properly designed and approved double-composite landfill liner" and will be "subject to all other requirements of state and federal law and regulation. . . ." These requirements are also matters of DEM licensure and regulation and are addressed in the Corporation's landfill license application.

The Southwest Landfill is located, as stipulated by the State Planning Council Site Certification document, on "that portion of generic site 'CSW' which also lies upon land now owned by the Rhode Island Solid Waste Management Corporation, as well as that portion of generic site 'CNW' which is now licensed as a landfill, and a marginal sliver of land which would serve to connect these two portions."

Generic sites "CSW" and "CNW" were identified and selected by the Corporation after a three-year statewide search for new landfill sites conducted for the Corporation by the University of Rhode Island pursuant to a Superior Court Consent Order of June 1989 and according to the requirements of Section 23-19-10.2 of the Rhode Island General Laws. Upon completion of the site search, the Corporation presented the results to the State Planning Council which issued its Site Certification.

6-4-10 State Planning Council Stipulations

- **The Corporation shall provide assurances that the Landfill is not adversely affecting the Scituate Reservoir.**

The Environmental Protection Agency, in its Record of Decision issued in 1994, accepted the finding that the Landfill had not and would not be a threat to the Scituate Reservoir.

- **The Corporation must maintain a system of ground water monitoring wells to be sampled and tested according to established procedures.**

The system of groundwater monitoring wells is maintained with sampling and testing regulated by DEM.

- **The Corporation shall provide technical reports to the Providence Water Supply Board.**

The Corporation has provided all data requested by the Providence Water Supply Board.

- **The Landfill shall not exceed its 6/28/93 height.**

The Corporation is in compliance with this requirement, as regulated by DEM.

- **Trash trucks shall not pass north of the existing landfill after Phase II closes.**

Phase II is still operational.

- **The Corporation shall cover and vegetate the north slope; mitigate wetlands alterations, if any; plan for future use and install bird control measures.**

The Corporation is in compliance with all these stipulations.

6-4-11 The Phase V Landfill

The Phase V Landfill is the final projected expansion of the Landfill as it is planned in 1996. It is shown in Figure 171-6(1). As can be seen from the map, the Phase V Landfill would be adjoining and south of the Phase I Landfill and also would be adjoining and east of the Phase IV Landfill. The Phase V Landfill would have an estimated footprint of about 33 acres; it is located largely within generic landfill sites CNW and CSW, which have been certified by the State Planning Council.

Figure 171-6(1)

Figure 171-6(1)
RIRRC PROPERTY



Rhode Island Resource Recovery Corporation
65 Shun Pike, Johnston, Rhode Island

Source: Rhode Island Geographic Information System.

Because the Phase V Landfill would piggyback up the slopes of both the Phase I and Phase IV Landfills, its estimated solid waste capacity of 12 million cubic yards is much larger than might otherwise be expected from a 33-acre facility. The 12 million cubic yards of Phase V will provide nearly 10 years of disposal at current loading rates and more than 13 years of disposal with aggressive recycling.

Permitting of the Phase V Landfill will begin as soon as the permitting of the Phase IV Landfill is completed. Under the most conservative of disposal scenarios, the Corporation would expect to begin construction of the Phase V Landfill baseliner in 2006 in order to ensure that a fully-lined facility is ready to receive trash when the capacity of the Phase IV Landfill is exhausted. The Corporation believes that there is a reasonable expectation, based on its best scientific and engineering estimates, that its application to permit and license the Phase V Landfill will be successful on technical grounds.

It is not expected that the permitting and licensing of the Phase V Landfill will encounter litigation opposition by the Town of Johnston, which, according to the Host Community Agreement ratified in April 1996 by the Town and the Corporation, "agrees that it will support and shall not oppose the Corporation's efforts" to permit and operate the Phase V Landfill.

6-4-12 Projected Landfill Life

For the purposes of long-term, total systems planning, Landfill life projections assume: 1) Solid waste disposal capacity calculations allow 18 percent of total landfill capacity for cover material; 2) landfill average density of 1,500 pounds per cubic yard; 3) a solid waste landfill loading rate of 750,000 tons per year; and proceeding from June 1996.

<u>Existing Licensed Facility (Phases II & III)</u>	Landfill Life
750,000 Tons/Yr Loading Rate	5.09 years

<u>Southwest Landfill (Phase IV)</u>	
750,000 Tons/Yr Loading Rate	5.7 years
With Aggressive Recycling	6.71 years

<u>Phase V Landfill</u>	
750,000 Tons/Yr Loading Rate	9.84 years
With Aggressive Recycling	13.27 years

<u>Total Landfill Life, Phases II, III, IV & V</u>	
750,000 Tons/Yr Loading Rate	20.63 years
With Aggressive Recycling	25.07 years

6-4-13 The Lined Landfill

DEM requires the base of a sanitary landfill must be at least five feet above the water table. The first step, therefore, taken by the Corporation in building its lined landfills is installation of a five-foot thick layer of gravel after the area to be lined has been graded. A 24-inch thick layer of very fine clay is then applied directly on the foundation and compacted to a rock-like density to render it impervious to leachate. The secondary membrane liner, which is made of HDPE plastic about 1/16 inch thick, is spread on the clay; the liner sections are welded with overlapping joints to ensure it is watertight. A four-inch perforated plastic secondary leachate pipe is placed on a filter fabric which has been stretched out on the plastic liner and covered with one-inch stone; the fabric is wrapped around the pipe and stone. The fabric and stone allow passage of liquid but prevent clogging of the pipe. The secondary liner is then covered with a 12-inch layer of washed sand for drainage, completing the secondary liner. The primary liner system is then built atop the secondary liner system, utilizing a geosynthetic clay liner topped by a geomembrane liner about 1/12 inch thick and an eight-inch perforated leachate pipe. The completed double liner system is about 5½ feet thick. The leachate that percolates down through the trash emplaced on the liner is pumped to a facility on site, is treated to standards established by the Cranston wastewater

system and then is discharged via a Corporation-owned and operated force main along Green Hill Road to the Cranston system at Plainfield Pike.

6-4-14 Findings

With the licensing of the Phase IV and Phase V Landfills and with the implementation of an aggressive recycling program as described elsewhere in this chapter, approximately 25 years of disposal life can be expected at the State Landfill at a loading rate of 750,000 tons of solid waste per year -- an extremely conservative assumption given the continued popularity of recycling.

Major portions of the four best 400-acre generic candidate landfill sites in the State identified in the URI siting study are situated on the Corporation's approximately 1,000 acres of land in Johnston.

6-4-15 Recommendations

The Corporation should implement the aggressive source reduction and recycling programs required for the maximum conservation of landfill capacity.

171-7 MANAGEMENT OF SPECIAL WASTES

7-1 INTRODUCTION

This part of the plan discusses special wastes and sets out programs and strategies for certain components of this waste stream, including white and brown goods and scrap metal, tires, demolition/construction waste, sludge, septage, agricultural waste, household batteries, used oil collection and management, and household hazardous waste.

7-2 TIRES

7-2-1 Introduction

It is estimated that nearly 1 million tire discards are generated in Rhode Island each year. A small percentage of truck tires are retreaded and resold; but by far the majority of worn tires enter the waste stream. Tires present unique waste management handling problems both in their collection and disposal.

7-2-2 Potential Environmental or Health Impacts, Composition of the Waste Stream, Quantity

Unmanaged stockpiled tires may become a breeding ground for mosquitos and are serious fire hazards. Tires buried in municipal solid waste landfills create their own problems; through the vibrations of heavy compaction equipment compacting the garbage, they are forced to the surface of the landfill, where they create pressure that may tear or distort surface liners.

The tire waste stream consists of steel-belted, bias ply, and solid tires from vehicles of all sorts, including: passenger cars, trucks, off-road equipment, motorcycles, airplanes etc. No formal studies on tire disposal practices have been conducted in Rhode Island.

The following quantitative estimates are based on national averages from a 1989 study conducted by A.D. Little Inc. for the State of New Jersey, as reported in Resource Recycling, February 2, 1990.

On average, 0.95 tires per capita are generated each year. The Rhode Island figure corresponds to approximately 950,000 tires or approximately 15,000 tons per year. Of this amount, 80 percent of the tires generated are passenger tires (average weight of 100 tires per ton) and 20 percent are truck tires (average weight of 25 tires per ton). A. D. Little estimates that one-third of all truck tires, or 17 percent of the total tire stream by weight, are recycled through truck retreading operations. Across the nation, on average, an additional 8 percent of the tires generated are recycled for materials or energy value.

Based on national averages, it is estimated that the annual size of the Rhode Island tire disposal stream is as follows:

Passenger:	697,000 units	6,970 tons
Truck:	111,000 units	4,380 tons
Total:	809,000 units	11,350 tons

7-2-3 State of the Waste Industry

Historically, most tires in the United States have been disposed of in dedicated tire stockpiles or are landfilled. Some states, such as Wisconsin, have banned the disposal of whole tires. New York City, however, permits disposal of shredded tires. The Corporation charges a \$5.00 per tire premium for the disposal of whole tires in the Landfill in order to discourage the practice. When disposal of whole tires is banned, alternative handling practices such as incineration, retreading, artificial reef construction, use in crash barriers, and use in the control of soil erosion should be employed.

Alternatively, tires may be shredded in a slow-speed, high-torque shredder. Shredded tires may then be landfilled; used in

temporary road construction in marshy or muddy areas; used as an auxiliary fuel source in solid waste, coal, or cement furnaces; or applied as a bulking agent in composting. Shredded tires may be further cracked, ground, and/or pulverized for applications in the manufacture of a wide range of low-tech molded rubber products (e.g. hockey pucks) or for use in asphalt-rubber road construction or the construction of road bases.

Vulcanized rubber is very resistant to being converted unless the tire is ground down into a fine powder. Generally speaking the finer the particle, the greater the cost. Nonetheless there is an ongoing effort to find uses for old tires, not only because of the annual production but most importantly to address the billions of discarded tires that are stockpiled throughout the country.

In the last three years, the most important development to affect the management of waste tires has been their combustion for purposes of energy recovery in facilities, specifically designed to burn tires and as coal and wood substitute fuels in existing facilities. An estimated 20 million tires are now being burned in New England alone, a rate which exceeds the region's generation of tires.

In all cases the direct cost of alternative processing options are considerably higher than stockpiling.

The capacity to process all the tires generated in southern New England, including Rhode Island, does exist.

One major tire recycling/disposal facility is currently operating in Hamden, Connecticut. This facility, operated by the Hamden Tire Co., is known as "the Tire Pond." It consists of a sorting and grading operation with an underwater stockpile of approximately 12 million tires in an inactive clay quarry. A shredder is planned for the site.

A 10 million tire per year tire-to-energy facility has been permitted and is currently in commercial operation in Sterling, CT. The facility, owned and operated by Oxford Energy Company, burns primarily whole tires to produce electricity. Since it is a Base Load Facility, it must produce energy 12 months of the year, and so the facility must obtain a reliable supply of tires year round. However, the cost of constructing a state-of-the-art power plant in the Northeast airshed has meant that the facility must charge a per tire disposal fee as well as being paid for the electricity they produce.

Usage of tires as tire-derived fuel (TDF) requires the transport of whole tires either to the furnace directly or to the shredders where the tire is reduced in size to one-to-two-inch chips and then to the furnaces. Both transport and shredding add expense, but when the resulting fuel value is measured against the delivered cost of coal, the TDF is often more economical. The use of TDF, however, is dependent upon the furnace being located in an area that permits the burning of coal, the installation of pollution control equipment requiring substantial capital expense, or relatively short transportation distances for the tires (or TDF) to the furnace.

F&B Enterprises, located in New Bedford, shreds and recycles bias-ply tires to create products with marine applications.

Bob's Tires, also of New Bedford, collects tires from local dealers and provides them to the tire derived fuel market.

Three paper mills in Maine have recently been permitted by that State to burn tire chips in their boilers to generate steam. These tire chips -- TDF -- are being used to supplement the wood that currently fuels these boilers. In 1994 the Maine mills paid \$48 to \$55 per ton for the TDF which represents an annual total of about 10 million tires.

The impact of this development on the waste tire marketplace and on the availability of waste tires has been profound. As recently as the early 1990's waste tires were one of the most problematical of wastes to manage; they were difficult and very costly to dispose of. The Oxford Energy incinerator charged a tip fee of \$65.00 per ton. In mid 1995, it has been reliably reported that Oxford Energy will pay for tires in certain circumstances.

7-2-4 Federal and State Regulations

a. Federal

In 1992, federal legislation was enacted providing that beginning in 1993 five percent of federally-supported highway construction had to utilize asphalt containing 20 pounds of crumb rubber per ton. The percentage of federally funded highway miles using this blend of rubberized asphalt increased by five percent per year until it reached 20%. The implementation of this statute has been deferred annually by Congressionally enacted one-year moratoria since then.

b. State

Since 1989, three pieces of legislation passed the General Assembly which will have important ramifications for the future of tire management in Rhode Island.

First, as the result of legislation enacted in 1989, tires were added to The Hard-to-Dispose law, RIGL §37-15.1, which provides that each new tire sold in the state carry a \$0.50 tax. The funds generated by this statute are used by the Department of Environmental Management to promote proper handling and recycling of tires. The second piece of legislation enacted in 1989 is RIGL §23-63-2, entitled "Vehicle Tire Storage and Recycling," which prohibits: stockpiling in excess of 400 tires in any site in Rhode Island; and the disposal of tires within Rhode Island except at a licensed tire recycling facility or a disposal facility designated by the Corporation. This law also requires the licensing of tire recyclers in the state.

In 1992, the General Assembly amended Chapter 23-63 of the Vehicle Tire Storage and Recycling Act which repealed the prohibition against selling tires out-of-state for incineration. The law also established a Tire Remediation account at the Port Authority from which DEM is authorized to spend to develop programs to eliminate the tire piles that have developed in the State of Rhode Island. The Fund is financed by a \$.75 per tire fee collected at retail. The Port Authority is authorized to sell \$8 million in revenue bonds to finance programs to eliminate the State's tire piles. These bonds have not yet been sold.

7-2-5 Current Management Practices

There are no licensed tire recycling facilities in Rhode Island, and RIGL §23-63-2 enables only the Corporation to establish or designate tire disposal facilities.

Prior to being classified as an EPA "superfund" site, the Davis Landfill in Smithfield received most of the state's old tires. Recent estimates of the size of this tire stockpile have ranged from the EPA Region I's estimate of 10 million to the popular press's estimate of 35 million tires, making Davis the second largest tire stockpile in the United States. This facility was never permitted to receive tires.

In November 1994, the DEM and the State's Attorney General entered into a consent order with William Davis, the owner of the Smithfield tire pile. Under the terms of this consent order, effective January 1995, Mr. Davis is required to remove at least 40,000 tires per month in 1995, 60,000 tires per month in 1996 and 80,000 tires per month thereafter until the pile is eliminated. In March, 1995, Mr. Davis began shipping tires, at an estimated rate of 40,000 tires per month, to the Oxford tire incinerator in Sterling.

In 1989, the Central Landfill adopted a 2-tiered tire management fee structure to encourage delivery of dedicated tire loads and to discourage delivery of tires mixed with garbage. Central Landfill charges \$5 for each tire in garbage loads and \$65 per ton for dedicated tire loads, which is equivalent to approximately \$0.65 per passenger tire. This rate structure has had a significant impact on tire delivery. Whereas only 100 tons of tires were delivered in dedicated loads in all of 1988, 525 tons of tires were received in 1989, and 1,600 tons in 1990. In the last four years, the Landfill handled an average of nearly 1,100 tons of tires annually, ranging from about 1,200 tons in 1991 to more than 800 tons in 1994. This delivery rate is approximately 14 percent of total tire discards statewide.

In June 1995 and for the previous two years, the Corporation disposed of all of its tires to Oxford Energy Company in Sterling under a contract which provided that Oxford Energy pick up the tires at the Landfill periodically and haul them

to the incinerator for a tipping fee of \$40.00 per ton. The Corporation in turn accepted at zero tip fee approximately 100 yards of bottom ash and gypsum from the tire incinerator daily for use as cover material with the approval of DEM. As a result of this arrangement, the Corporation earned \$25 per ton for tires disposed at Oxford and saved the cost of mining or paying for virgin cover material.

The expanded MRF, the construction of which began in mid-1995, has been designed to handle waste tires. This will improve the Corporation's tire-handling and processing capability.

7-2-6 Findings

- Large stockpiles of tires present serious health and environmental hazards. The William Davis tire dump, with 12 to 35 million tires, represents a potential fire catastrophe.
- A large portion of tires discarded in Rhode Island are unaccounted for. Some are no doubt being dumped illegally, either on back roads, vacant urban lots, or at unidentified facilities.
- There is no tire processing capacity within the state, although the plentiful tire processing and disposal capacity that exists in nearby Massachusetts and Connecticut could be used.
- The recent development of the combustion of tire chips in large industrial boilers for energy recovery is expected to make a major impact on the scrap tire disposal situation and is likely to lead to an increased demand for scrap tires.
- The new tire-derived fuel market is also likely to slow the further development of technological advances, such as shredding/granulation for the purpose of tire recycling.

7-2-7 Recommendations

- Future tire management practices will be shaped significantly by the extent to which illegal dumping is controlled, stockpile bans are implemented, and the further development of the use of tire chips as a fuel substitute in power plants, as demonstrated by the situation in Maine.
- The Corporation and DEM should continue to monitor the scrap tire market situation very carefully to ensure that the waste tires being generated continue to move to tire management facilities that have received environmental permits for waste tire storage or tire recycling.
- In addition, the Corporation should continue to explore opportunities with the private sector to determine if an end-market tire recycling operation at a Corporation facility is economically viable. In 1994-95 such operations did not appear to be economically viable if related to the current market price for virgin plastic and synthetic rubber. Other factors include competition from lower cost shredding/landfill operations within a 50-mile radius of the Providence Metropolitan Area.
- The State should continue to work with the other Northeast States through NEWMOA (Northeast Waste Management Officials Association) to coordinate regional legislation and recycling options to insure that beneficial reuse becomes the norm not only for "fresh" used tires but also for the piles that exist throughout the region.

7-3 WHITE AND BROWN GOODS AND SCRAP METAL

7-3-1 Nature of the Material

White goods are large appliances, primarily composed of ferrous metal, primarily found in the municipal waste stream. They include stoves, ovens, refrigerators, washers, dryers, etc. White Goods are often collected, recycled, or disposed of mixed with other bulky materials, such as scrap metal which, in the municipal (non-demolition) solid waste stream, includes cabinets, lockers, ductwork, tire rims, bicycles, mattress frames, etc. The term "brown goods" describes household or commercial electronics equipment such as televisions, stereos, cassette players, computers, and calculators.

7-3-2 Potential Environmental or Health Impacts, Composition, Quantity

Bulky metals have a negative visual impact when viewed as rusting hulks strewn on the roadside and present processing problems in landfills because they are often difficult to compact.

In addition, white goods have a number of potentially significant environmental problems. The capacitors of certain older appliances, many lighting ballasts, and most electrical transformers contain oil with PCBs -- a Hazardous Waste. Refrigerators, freezers, and air-conditioners often contain freon and CFCs, chemicals suspected of depleting ozone in the Earth's atmosphere.

Many brown goods are also suspected of having some PCB laden components, such as the coatings on circuit boards. Electronic components are composed of precious and heavy metals. Dry cell batteries in brown goods contain lead, nickel, or cadmium, which are toxic in high concentration.

The composition and quantity of white goods, brown goods, and scrap metal in Rhode Island's solid waste stream is not known.

7-3-3 State of the Waste Industry

Most clean, large, segregated loads of scrap metal, white goods, and brown goods are delivered to recycling processors where they are shredded or baled. The processed ferrous is then sent either to domestic mills or to export facilities. Precious metals are extracted from shredded brown goods and sent to smelting operations for further purification.

Given the low value of the material in current scrap markets, there is virtually no intrinsic economic incentive to pull these materials from mixed solid waste loads for their scrap value. However, transfer stations, waste-to-energy facilities, and most smaller landfills will pull the bulky materials from the waste loads to realize savings on avoided costs such as savings in tip fees, capacity, or transport costs.

7-3-4 Federal and State Regulations

a. Federal

The Federal Toxic Substances Control Act (TSCA) bans the manufacture, import, export, and disposal of PCBs (except disposal at hazardous waste facilities). Household appliance capacitors are exempted; under TSCA, they may be disposed of in municipal solid waste landfills. However, State regulations apply, as described below.

In July 1992, a federal statutory requirement to recover freon and CFCs from white goods for the purpose of recycling these gases, went into effect. This requirement is enforced directly by EPA.

b. State

The Rhode Island Department of Environmental Management has PCB clean-up regulatory policy standards of one PCB part per million. These standards are the most stringent in the nation. Residues are defined as hazardous wastes if their PCB concentration exceeds 50 parts per million. Legal action has been taken against local white and brown goods

shredders. As a result, the operators refused to accept municipal materials for approximately a six month period beginning in late 1988. Contaminated auto shredder residue ("auto fluff") had also been illegally disposed of at a previously closed local landfill.

DEM regulations promulgated in June 1991 require CFCs and PBC capacitors to be removed from bulky waste prior to processing or disposal.

White Goods are defined as recyclable materials under the DEM municipal recycling regulations. This classification has had little or no impact on handling practices, as plans have not yet been formalized concerning the collection of this material.

7-3-5 Current Management Practices

White goods and bulky scrap metal are frequently collected from households and small businesses seasonally, by appointment-only, or by drop-off-only methods. These collection methods are generally separate from normal garbage collection. Scrap recyclers will often provide separate containers to larger generators of scrap metal, landfill, and transfer stations.

Two major ferrous metal processing companies, one major brown goods processing company and several smaller ferrous shredding and processing operations are located in Rhode Island. Virtually all ferrous metal, white goods, and brown goods (from electronic manufacturing and site demolition projects) are delivered to these firms. The Port of Providence is developed for the export of shredded metals.

Commercial generators of scrap metal generally deliver their materials directly to the recyclers since the regular commercial waste disposal tip fee is charged at the scale. In 1990, however, less than 300 tons of ferrous metal was delivered to the Central Landfill. This material is stockpiled, loaded into containers, and shredded off-site for recycling. An unknown quantity of white goods, scrap metal, and brown goods arrives in mixed solid waste loads and is buried in the landfill.

Between 1990 and 1994 between 150 and 200 tons of white goods were delivered annually to the Landfill, almost all by municipalities, which picked them up from residences as trash or during bulky waste clean-up drives. Since 1992, the Corporation has contracted for the removal of the CFCs; the white goods are then sold to a local scrap dealer who removes the PCB capacitors and then sells the goods for their scrap metal value.

7-3-6 Future Management Practices

The Corporation's ramped commercial recycling area began operation in January 1990. The Corporation anticipates that this facility will enable it to sort more ferrous metal from incoming waste loads from small vehicles. The viability of recovering brown goods processing and recycling off-site will also be investigated for this site. No post-consumer recycling of household electronics is conducted in Rhode Island. These processes are technologically possible and for environmental (ash toxicity, air emissions) and economic reasons, may be advisable.

7-3-7 Findings

- Rhode Island has an excellent processing and export (rail, port, road) infrastructure for the recycling of white goods, brown goods, and scrap metal and has landfill capacity for the disposal of process residue.
- The Port of Providence is well-suited for the processing and export of scrap metals. One major scrap metal business is active at this location. A second has closed its operation due to regulatory problems.

7-3-8 Recommendations

- Establish a formal working group consisting of SWMC, DEM, private recycling processors, and appliance retailers to provide a network to deal with recycling processing issues; the regulation/enforcement of residue generation, disposal, and clean-up; and responsibilities for CFC and PCB capacitor removal.

7-4 CONSTRUCTION WASTE AND DEMOLITION DEBRIS

7-4-1 Introduction/Nature of the Material

In 1986 construction/demolition (C&D) waste accounted for approximately 8.5 percent of the waste disposed at the Central Landfill. The two waste streams that make up this category are commonly considered together but, as will be indicated in the following discussion, have somewhat different characteristics and management practices.

However, C&D waste is a far more important component of all solid waste generated in Rhode Island than is indicated by the quantities disposed at the Landfill, because of methods of disposing C&D that are not available to other forms of solid waste. The impact of C&D waste on overall solid waste management in the state is apparent in several ways.

Some of the C&D waste generated is disposed of in permitted landfills in Rhode Island. In reality, however, a large portion of the C&D material that is not currently reused or recycled is not disposed of in permitted solid waste management facilities in the state. Instead, the material is illegally burned or buried on-site; stockpiled on-site; disposed of by other illegal methods; disposed of in out-of-state facilities, or disposed of illegally out of state.

The field of construction/demolition (C&D) debris management has experienced perhaps the fastest growth of recycling of any of the various sectors of solid waste. Whereas 10 years ago virtually no C&D debris was recycled and nearly all of it was landfilled, today very little C&D is landfilled while most is recycled. The literature concerning C&D, although still sparse, has grown together with the growth in C&D recycling.

Rhode Island is fortunate to have available perhaps the most detailed and exhaustive statewide study of the characteristics of the C&D waste stream and the recycling of materials in the C&D waste stream. This study entitled, "Recycling Construction and Demolition Debris in R.I." dated December 1992, was prepared by the firm of C.T. Donovan Associates, Inc. of Burlington, Vermont with the financial support of the Governor's Office of Housing, Energy and Intergovernmental Relations.

The Donovan report addresses in detail the composition of C&D waste, how it is generated, generation rates and how it is recycled overall and on a component-by-component basis for the major components.

In addition to the Donovan Report, the New England Governors' Conference issued a report entitled "Construction Aggregates Demand in the New England States," January 1992, which is very useful in helping to identify markets for aggregates which can be produced from the concrete, brick, stone, asphalt, building blocks, glass and dirt in the C&D stream.

Although there is now a very significant amount of private sector recycling activity in this field, precise tonnage data from these operations is not available because private recyclers are not anxious to provide information which their competitors could use.

7-4-2 Composition of the Waste Stream/Quantity

The term, "construction and demolition debris" is defined in R.I.G.L. 23-18.9-7. The materials found in construction waste and demolition debris are rubble, asphalt, gypsum cement, brick, stone, glass, vanities, plaster, wood (framing, windows, siding, plywood), ferrous metal (piping, ductwork, reinforcement bar, white goods), miscellaneous paper (liner, corrugated, wallpaper). Construction waste and demolition waste may also include plastic (packaging, piping, siding), non-ferrous metals, carpets, and quantities of any other component of the solid waste stream. In general, construction waste loads are cleaner and more uniform than demolition debris loads.

C&D waste is generated by a wide variety of construction, renovation, and demolition activities. They range from small home-improvement programs. Overall, there are two major categories of activities that generate C&D waste.

They are: building-related construction, renovation, and demolition; and road- and bridge-related construction, repair, and demolition.

Most construction waste and demolition debris is hauled to the Landfill in mixed, open roll-off boxes. Other types of waste also are disposed of in these roll-off containers. In addition, dedicated loads of demolition waste are hauled to the landfill directly by demolition contractors.

If the mixed and dedicated loads of demolition are combined, then the estimate of the disposal rate of these materials at the Landfill since July 1, 1987, is approximately 250 tons per day.

The last analysis of the estimated daily tonnage of construction/demolition waste disposed of at Central Landfill performed in August 1987, resulted in an estimate of approximately 400 tons per day.

Between 1987 and 1991, approximately 310 tons per day of construction/demolition debris were disposed of at Central Landfill representing a decrease of about 23 percent from the disposal level recorded prior to 1987. From 1991 to 1994, the disposal of C&D at the Landfill dropped to an average of 1,500 tons per year or about five tons per day. During this period, the Department of Environmental Management did not report any intensification of out-of-state or illegal disposal activities. The very sharp decrease in disposal at the Central Landfill is attributed to intensified recycling activities.

According to the Donovan Report, the composition and disposition of certain wastes found in and mixed with the Rhode Island C&D stream in 1991 was as follows:

<u>Material</u>	<u>Reuse/</u>	<u>Permitted</u>	<u>Other</u>	
<u>Generation</u>		<u>Recycling</u>	<u>Disposal</u>	<u>Disposal</u>
Wood	162,000	55,000	24,000	83,000
Asphalt	572,000	515,000	6,000	51,000
Concrete	194,000		95,000	7,000 92,000
Metal	61,000	55,000	2,000	4,000
Brick	44,000	22,000	3,000	19,000
Soil	58,000	57,000	1,000	Minimal
Rock	29,000	29,000	Minimal	Minimal
Cardboard	11,000		8,000	1,000 2,000
Miscellaneous	84,000		Minimal	21,000 63,000
TOTAL	1,215,000	836,000	64,000	314,000
	(69%)	(5%)	(26%)	

Miscellaneous materials include plastic, roofing materials, siding, insulation, glass containers, floor tile, ceiling tile, ceramic tile, carpet, porcelain and gypsum.

7-4-3 State of the Industry

A number of individual landfill and transfer station operators process demolition waste at their facilities, some recycle various elements of the material and some merely reduce the volume of the material. The motivation for these efforts is not primarily to generate revenue from the sale of recyclable material, but rather to achieve disposal or hauling cost savings. Waste generators pay a tip fee for this service.

In 1989, New England Ecological Development (NEED) began operation of a demolition recycling facility on or near the property owned by American Waste Disposal, adjacent to the Central Landfill. The Corporation estimates that the facility handles an estimated 250,000 to 300,000 tons annually of commercial waste including C&D. NEED accepts material from out-of-state. No residue from this operation is disposed of at the Central Landfill, so that either 100 percent recycling is achieved or non-processible materials are stockpiled on site or disposed of out-of-state.

NEED, the largest recycler of C&D in the State, produces a variety of products in addition to selling recovered materials for their scrap value. For example, NEED produces various mulching and compost materials and pressed fireplace logs from the woody materials extracted from the C&D stream.

Truk-Away, the largest independent contract hauler of solid waste in the State, has been processing C&D for years at its transfer station on Jefferson Boulevard in Warwick. Truk-Away specializes in shredding wooden pallets and selling the chips to industrial boilers in northern New England for fuel.

Hometown Properties, Inc. which operates an active, licensed C&D landfill on Dry Bridge Road in North Kingstown, also processes C&D, using a trommel screen and a large impact shredder, producing for the most part, wood chips sold as

boiler fuel or for other reuse. Most of the C&D landfilled or processed for recycling by Hometown Properties comes from out of state.

Another large processor of C&D material is Liberty Disposal Co. located on Shun Pike in Johnston. Liberty, like NEED, Hometown Properties, and Truk-Away, recovers a variety of materials from the C&D stream, particularly wood chips, corrugated cardboard, metal and dirt.

In 1994, Macera Brothers of Cranston, Inc., an independent hauler, opened a transfer station on Plainfield Pike in Cranston where the firm recovers and recycles materials from the C&D stream which the company handles.

The explosion in C&D recycling has been a boon to the Corporation because the C&D recycling activities generate residues which are useful to the Corporation's landfill operations as cover material. The Corporation receives an estimated 20,000 tons annually of C&D screenings from Liberty Disposal and about 17,000 tons annually from Truk-Away. Hometown Properties began to ship C&D screenings to the Landfill in the Spring of 1995 for use as an alternate cover material.

The Corporation accepts these residues for zero tipping fee and, with DEM permission, uses them as cover materials in lieu of the virgin soils that have been historically used. This represents 15-20% of the Landfill's total daily cover requirements. The avoided cost ranges from about \$50,000 to \$200,000 annually depending on whether these C&D residues displace dirt mined by Corporation personnel on its property or purchased on the open market off-site.

The Corporation also supports the recycling of C&D by taking clean wood chips at as low a handling charge as possible to cover its handling cost. The Corporation uses this material for slope stabilization or mixes it with unstabilized compost as a bulking agent. For example, in 1990, the Central Landfill received nearly 12,000 tons of wood chips from local construction and demolition waste and pallet recyclers. Monthly deliveries averaged 1,000 tons with a high of 4,600 tons in October, and a low of 145 tons in July. These figures exhibit both the unstable nature of the production of waste and the availability of markets for recycled products. The Corporation's use of wood chips is dependant upon its landscaping requirements and fluctuates accordingly.

- **Technology:** The most prevalent equipment for processing and/or recycling demolition waste is manufactured widely in the United States. It consists of conveyors (steel-belt, pan), crushers/impactors, shredders or tub grinders, and magnetic drum separators for ferrous materials. Additional processing equipment may include a trommel screen (size classification), flotation screen (density classification), secondary shredder, wood chipper, baler, or some combination. Most operations load materials with a front-end loader (although grapple-fed shredders are available) and utilize manual separation to various extents. Demolition waste recycling operations typically are not enclosed in a building.

- **Equipment Supply and Installation:** Few, if any, U. S. equipment manufacturers offer a pre-designed, full demolition waste processing system. A demolition recycling facility operator typically must secure the services of an architecture & engineering (A/E) firm with experience in industrial processes or materials handling, to develop a preliminary design and bid specifications for the system components to satisfy system needs. Alternatively, equipment manufacturers and distributors offer their own design support. European equipment manufactures are in the forefront of this recycling market.

- **Secondary Market:** C&D waste recycling operations produce fill, dirt, shredded ferrous metal, wood (shreds, chips), and corrugated cardboard (potentially recoverable from clean construction loads). Bricks that are not removed at the demolition source site may be size-classified and/or hand-culled for reuse. The quantity of residue is dependent upon load composition.

Fill material generated from broken-down demolition rubble can be used in place of virgin excavation for landscaping, site preparation, road building, or landfill cover. Dirt or "fines" (from plaster, glass) can potentially be used in place of sand in concrete aggregate and in any fill application. Wood chips can be used in landscaping applications or as bulking agents in composting operations. Alternatively, clean C&D waste wood chips are sought by wood-burning electricity plants. Ferrous metal and corrugated can be sold to secondary materials markets.

7-4-4 Federal/State Regulations

Solid waste management regulations require that construction waste and combustible portions of demolition waste receive daily covering along with other refuse. State law explicitly prohibits disposal of solid waste in quantities in excess of three cubic yards on any site other than a licensed solid waste management facility. This provision of RIGL §23-18.9-5 encompasses construction and demolition wastes, including used asphalt, concrete, portland cement, and tree stumps, but excluding clean fill. Recycling of C&D waste and alternative management methods for clean fill occur within the State to a currently unknown degree.

In 1991, state commercial waste recycling regulations mandated that uncontaminated wood waste is to be recycled if it is readily separable from the rest of the C&D debris of which it is part, and it is illegal to dispose of waste containing in excess of 20 percent recyclable waste.

In 1994, a statute requiring that DEM license C&D processing facilities was enacted. This new law established siting, construction and operating standards for C&D processing facilities, thus giving DEM better regulatory control over a burgeoning segment of the solid waste industry.

The Landfill is the state's largest licensed solid waste management facility receiving C&D materials and appears to be receiving most of the material generated in Rhode Island that is landfilled. Minor amounts may also be disposed at remaining municipal landfills. The Hometown Properties C&D landfill, which had been closed by the DEM in 1987,

resumed operation under a court order in 1991.

In 1987, the Corporation issued a Determination of Need for a permit for up to 400 tons per day of demolition material to be disposed at a proposed landfill in Richmond. The Determination was based on 1986 Central Landfill data and included the requirement to recycle. The permitting efforts for this landfill have been delayed in the courts and the facility has not been developed.

7-4-5 Current Management Practices

Since 1989, the Central Landfill has handled very little construction and demolition waste. The Corporation has supported private recycling efforts acting as a market for low grade products from these operations.

In 1994, the Corporation completed an economic feasibility study pertaining to the development of a C&D debris recycling facility. Conducted by Wehran Engineering Corporation of Middletown, NY the feasibility study examined three different equipment system configurations designed to process C&D primarily to produce landfill cover material for the Corporation's use. Facilities of three different production capacities -- 52,000, 65,000 and 78,000 tons per year -- were examined for three different financing -ownership - operating structures.

7-4-6 Future Management Options

- Potential for Further Waste Reduction: The demolition/construction waste stream will be reviewed to determine whether further source reduction and recycling might be achievable.

Source reduction might be effectuated by changes in architectural, engineering, and construction practices: in the building process, this might include design and materials that increase building lifespan; use of high strength/low-bulk materials; use of recycled or recyclable materials; reuse of excess construction materials at other project sites; standardization of designs and materials, which would reduce construction waste by minimizing design uncertainty and defective waste materials.

Disposal costs represent only a small percentage of the cost of a building; so there is much more incentive for the waste disposal industry to carry out waste reduction or recycling efforts rather than for the construction industry.

- Potential for Integrating with Processing of Other Materials: Many materials that are non-processible or difficult to process at a resource recovery facility may be processed using the same equipment as that used to process demolition waste and can compatibly be introduced into an integrated demolition waste processing equipment line. In many cases, some materials preparation may be required prior to processing. Such materials include:

- * pallets, brush, tree limbs, railroad ties, bulky wood waste;
- * carpet waste;
- * rocks, boulders, asphalt;
- * car tires, truck tires, industrial equipment tires;
- * steel drums, white goods, auto parts, bicycles, wire, cable, (resource recovery facility non-

processibles).

- Comparison of Alternative Technological Approaches - Centralization vs. Decentralization: To offer maximum recovery of separate materials, a construction/demolition recycling facility must be integrated. Because construction/demolition waste is composed of a wide mix of recoverable materials that should be processed separately to have market value, a complete integrated processing equipment system is required. The same integrated system can also be used to process and recycle other bulky wastes (see Chapter 7-4), but not vice versa. The integrated processing equipment approach has wider application than its independent component parts. A complete, integrated construction/demolition waste recycling facility can be a relatively sophisticated processing operation.

7-4-7 Findings

- Landfills are excellent sources and markets for construction/demolition waste materials. An operating landfill with inadequate cover material or a landfill in the closure and landscaping phase can be a major market for processed construction/demolition products (high volume uses for rubble, fines, and wood chips). A landfill site typically has sufficient outdoor space to locate processing equipment, waste storage areas, and product storage areas.
- The quantity of C&D waste generated in Rhode Island represents a significant portion of the total amount of all types of solid waste generated. Increasing the recycling of C&D waste reduces the total amount of solid waste in the state that must be landfilled or disposed of in other ways.
- Many of the materials recovered and processed from C&D waste can be used in new construction projects, and are a cost-effective alternative to virgin materials.
- Asphalt pavement removed during road reconstruction or repaving projects can be used as a source of aggregate and asphalt in new pavement.
- Concrete removed from demolished structures and bridges can be crushed into aggregate for use in new concrete, or can be used as a base material for roads and new structures.
- Wood waste generated during the construction, renovation, and demolition of buildings can be processed and sold for landscaping mulch, animal bedding, fuel, and other uses.
- Gypsum wallboard removed during renovation and demolition projects can be processed into a raw material and used in the manufacturing of new wallboard.
- C&D waste recycling is a rapidly growing industry involving numerous private companies that collect, separate, process, and recycle C&D waste. Examples of the type of firms that benefit from C&D waste recycling are:
 - Construction and demolition firms for whom it can be more cost-effective to separate and recycle certain materials than to pay for disposal. The companies also benefit by obtaining revenue from the sale of the recycled product, or by using the recycled materials themselves in future projects.
 - Waste haulers and transfer stations who separate recyclable C&D waste in order to reduce tipping fees paid for

disposal of the material at landfills. They may also benefit by obtaining revenue from the sale of the recovered materials to recycling facilities or end users.

- Recycling facilities that charge a tipping fee to accept C&D waste and that may also receive revenue from the sale of their recycled product(s).

7-4-8 Recommendations

- The Corporation and DEM should further study waste reduction (source reduction and recycling) efforts in this waste stream. The construction industry should be targeted for source reduction programs, while the disposal industry should be targeted for recycling programs.
- The Corporation and DEM should work with local officials who issue demolition permits to integrate reduction/recycling objectives into the building demolition permit process.
- Decentralized processing of select components of construction/demolition (and other bulky) waste components is more readily achievable at this time, although central processing would seem to be more cost effective from a supply, processing, and market standpoint. The Corporation should examine the processing capabilities of existing recycling operations. If these are found to be less than adequate, the Corporation should develop a facility at the Landfill.

7-5 SEPTAGE

7-5-1 Nature of the Material and Quantity

Septage is any solid, liquid, or semi-solid removed from septic tanks, cesspools, privies, domestic wastewater holding tanks, or other individual sewage disposal system (ISDS). It is composed of concentrated, water-borne materials that have undergone varying degrees of anaerobic decomposition, and is characterized by large quantities of solids, grit and grease, and offensive odors. It also contains pathogenic organisms, which can leach from malfunctioning septic systems and contaminate ground and surface water.

In the past, most of the state's waste water treatment plant sludge, including that resulting from septage treatment, has been landfilled, but a DEM order has greatly reduced the amount of sludge that can be dumped at Central Landfill.

Table 171-7 (1) shows quantities of residential septage generated, by municipality, along with the disposal capacity of the municipality, as estimated by the Department of Administration's Division of Planning. What is clear is that many towns served by ISDSs have no disposal capacity for septage, while many of the municipalities with waste water treatment facilities have excess capacity, since they have few or no households served by ISDSs. However, most waste water treatment facilities do not accept septage from outside their service districts. In addition, many waste water treatment plant operators believe they do not have the capacity indicated due to operational problems.

The Town of Charlestown has established a Waste Water Management District but has yet to implement its program since it has not yet identified where the septage will be disposed of.

The quantities of commercial septage being generated are difficult to estimate. The content of commercial septage is generally the same as domestic, although certain establishments pose particular problems. Restaurants, for example, generate septage containing large quantities of grease. The City of Cranston has a grease handling facility available to handle grease from throughout the state.

Septage does not enter the solid waste stream unless it is treated in a waste water treatment facility, the resulting sludge is landfilled, composted or burned in a sludge incinerator, and the resulting ash landfilled.

7-5-2 State of the Waste Industry

Fifty seven licensed septage haulers operated in Rhode Island in 1995. Sixteen waste water treatment plants accept septage in 1995, but most restrict the source, as seen in Table 171-7 (2). The Narragansett Bay Commission (NBC) had a permanent septage receiving facility under consideration in mid-1995. Cranston and the Rhode Island Port Authority Quonset Point facility take septage from anywhere in the State.

Table 171-7 (3) shows the septage design capacities of each of the state's waste water treatment facilities and compares them to the amount of septage which would be generated if each residence were to have their 1,000 gallon tank pumped every third year.

The final column, column 5, shows the amount of septage capacity of the facility minus the predicted residential septage generation presented in column 4, but does not take into consideration the amount of residential and commercial septage currently disposed of at the wastewater facilities.

7-5-3 State Regulation

The State of Rhode Island is responsible for septage management in two ways: permitting ISDS's and licensing septage haulers. Under RIGL § 42-17.1-2(1), DEM has authority to assure that adequate and sanitary ISDS's are provided for all dwellings and buildings not served by public sewage systems. The location, design, and installation of ISDSs are regulated by DEM.

Septage is subject to hazardous waste transporter regulations promulgated by DEM's Division of Air and Hazardous

Materials. Septage haulers are required to maintain records indicating the source and estimated volume of septage pumped, the date of shipment, and the date of delivery at a treatment facility.

Table 171-7 (1)

ESTIMATED RESIDENTIAL SEPTAGE DISPOSAL VOLUMES

City or Town	Total Housing Units	Housing ¹ Units Served by ISDS	Yearly ² Septage Volume	Daily ³ Septage Volume	Daily ⁴ Septage Disposal Capacity
Barrington	5,676	276	92,000	307	-----
Bristol	7,351	2,836	945,333	3,151	3,000
Burrillville	5,331	3,462	1,154,000	3,845	1,170
Central Falls	7,667	0	0	0	BVDC-50,000
Charlestown	3,825	3,825	1,275,000	4,250	-----
Coventry	10,478	10,454	3,484,667	11,616	-----
Cranston	29,254	2,035	678,333	2,261	50,000
Cumberland	9,847	3,801	1,267,000	4,223	-----
East Greenwich	4,149	3,449	1,149,667	3,832	1,000
East Providence	20,159	300	3,000	0	11,000
Exeter	1,687	1,687	567,333	1,891	-----
Foster	1,337	1,337	445,667	1,486	-----
Glocester	3,163	3,165	1,054,333	3,514	-----
Hopkinton	2,513	2,513	837,667	2,792	-----
Jamestown	2,426	1,526	508,667	1,696	4,000
Johnston	9,621	5,121	1,707,000	5,690	-----
Lincoln	6,784	3,784	1,261,333	4,204	-----
Little Compton	1,832	1,832	610,667	2,036	-----
Middletown	7,099	4,299	1,433,000	4,777	-----
Narragansett	7,686	4,398	1,466,000	4,887	-----
Newport	12,268	3,756	1,252,000	4,173	17,000
North Kingstown	9,538	9,538	3,179,333	10,598	-----
North Providence	12,477	0	0	0	-----
North Smithfield	3,741	2,391	797,000	2,657	-----
Pawtucket	30,682	0	0	0	BVDC
Portsmouth	6,400	6,400	2,133,333	7,111	-----

Table 171-7 (1)
ESTIMATED RESIDENTIAL SEPTAGE DISPOSAL VOLUMES
(Continued)

City or Town	Total Housing Units	Housing ¹ Units Served by ISDS	Yearly ² Septage Volume	Daily ³ Septage Volume	Daily ⁴ Septage Disposal Capacity
Providence	68,211	0	0	0	----
Richmond	1,751	1,751	583,667	1,946	----
Scituate	3,256	3,256	1,085,333	3,618	----
Smithfield	6,160	3,160	1,053,333	3,511	8,000
South Kingstown	9,152	7,252	2,508,333	8,361	20,000
Tiverton	5,399	5,399	1,799,667	5,999	----
Warren	4,599	1,599	533,000	1,777	10,000
Warwick	34,048	23,648	7,882,667	26,276	24,000
West Greenwich	1,207	1,207	402,333	1,341	----
West Warwick	11,310	2,310	770,000	2,567	----
Westerly	9,751	3,751	1,250,333	4,168	16,000
Woonsocket	18,718	8,614	2,871,333	9,571	29,000
Total	396,553	143,892	47,964,000	160,132	244,700

1. Based on 1986 housing data.
2. Gallons per day on 1,000 gallons per housing unit, divided by 3 (systems pumped every 3 years).
3. Gallons per day based on yearly volume divided by 300 (number of pumping days per year).
4. Gallons per day based on current design constraints of wastewater treatment facilities as determined by the DEM - Division of Water Resources.

Source: RI Department of Administration, Division of Planning

Table 171-7 (2)

COMMUNITIES SERVED BY WASTEWATER TREATMENT PLANTS THAT ACCEPT SEPTAGE

<u>Facility</u>	<u>Communities Required</u>	<u>Other Communities</u>				
	<u>To Serve</u>	<u>Served</u>				
NBC\Bucklin Point	E. Prov., C.F., Pawt., Cumb. and Linc.	*				
Bristol	Bristol	*				
Burrillville	Burrillville	*				
Cranston	Cranston	Accepts septage from any Community				
East Greenwich	East Greenwich	*				
East Providence	E.P., Barr.	*				
Jamestown	Jamestown	*				
Newport	Port., Midd. and Newport	*				
RI Port Authority	All Communities	Accepts septage from any Community				
Smithfield	Smithfield	*				
South Kingstown	S.K., Narr.	*				
Warren	Warren	*				
Warwick	Warwick	*				
West Warwick	W. War., Cov.	*				
Westerly	Westerly	*				
Woonsocket	Woon., N. Smith., Blackstone, MA	*				
SOURCE:	Divison	of	Planning,	Department	of	Administration

In addition, local governments may elect to establish waste water management districts, under the authority of RIGL §45-24.5, the "Rhode Island Septic System Maintenance Act of 1987," in which case the district regulates septic system maintenance.

7-5-4 Septage Management

Individual sewage disposal systems can clog and fail to operate properly, creating a potential source of contamination for surface and ground waters and thus a health hazard. An ISDS requires regular maintenance: systems should generally be pumped out about every three years, although this is often not done. In the absence of regulation, most homeowners do not feel compelled to perform routine maintenance, and many are ignorant about the consequences for failing to maintain their systems.

To alleviate this problem, the General Assembly in 1987 passed the Rhode Island Septic System Maintenance Act. This enabling legislation authorized Rhode Island cities and towns to adopt ordinances creating Waste Water Management Districts (WWMD) and procedures to administer them.

The adoption of an appropriate ordinance under RIGL §45-24.5 allows the municipality:

- the authority to order routine pumping and maintenance of ISDSs, to levy fines for non-compliance, and to provide for the passage of district officials and septage haulers onto private property for periodic inspection of ISDSs;
- to raise funds for the administration, operation, contractual obligations and services of the WWMD;
- to establish administrative, financial, technical, enforcement, maintenance, and legal structures and to hire personnel to implement and conduct a program;
- to establish a public education program;
- to designate proper collection and disposal sites for septage collected by authorized pumping and hauling agents; and
- to contract with other cities and towns for septage disposal through waste water treatment plants.

Table 171-7 (3) 2 pages

Table 171-7 (3)					
SEPTAGE DISPOSAL AREAS					
Area	City or Town	Septage ¹ Design Capacity	Daily ² Septage Received	Residential ³ Septage Volumes	Difference Between Columns 3 + 5
1	Burrillville	1,700	4,100	3,845	-2,145
2	Woonsocket	29,000	3,600	12,228	16,772
3	North Smithfield				
	Pawtucket	50,000	23,400	8,247	41,573
	Central Falls				
	Lincoln				
	Cumberland				
4	Smithfield	8,000	1,870	3,511	4,489
5	Warwick	24,000	25,500	26,276	-2,276
6	East Greenwich	1,000	0	3,832	-2,832
7	South Kingstown	20,000	9,000	13,248	6,752
	Narragansett				
8	Westerly	16,000	15,300	4,168	11,832
9	Jamestown	4,000	2,600	1,696	2,304
10	Newport	17,000	9,400	16,061	939
	Middletown				
	Portsmouth				
11	Bristol	3,000	4,000	3,151	-151
12	Warren	10,000	550	1,777	8,223
13	East Providence	11,000	2,400	307	10,693
	Barrington				
14	Cranston ⁴	50,000	36,500	2,261	47,739
15	West Warwick ⁵	10,000	n/a til 1992	14,183	-4,182
	Coventry				

Table 171-7 (3)

SEPTAGE DISPOSAL AREAS
(Continued)

Area	City or Town	Septage ¹ Design Capacity	Daily ² Septage Received	Residential ³ Septage Volumes	Difference Between Columns 3 + 5
16	Quonset ⁶ North Kingstown Exeter West Greenwich Richmond NBC Providence North Providence Johnston Towns with no available septage disposal sites & daily septage volumes	16,000 (Designed - but no funds to construct)	-	15,776	
17		140,000	no existing facility	5,690	134,310
18	Charlestown Exeter Foster Glocester Hopkinton Johnston Little Compton	(4,250) (1,891) (1,486) (3,514) (2,792) (5,690) (2,036)	North Kingstown Richmond Scituate Tiverton West Greenwich	(10,598) (1,946) (3,618) (5,999) (1,341)	
	Total			39,471	

1. Gallons per day (gpd) based on current design constraints as determined by DEM
2. Average daily septage received 1988 gpd over 300 days as determined by DEM
3. Assumes each residence has 1,000 gallon tank pumped once every 3 years. GPD based on yearly volume divided by 300 (number of pumping days per year)
4. Takes septage from any community
5. Septage facility will not be available until 1992
6. Facility designed, but no funds to construct. Towns listed are hypothetical examples.

Regular inspections of ISDSs and the implementation of regional pumping and maintenance programs would reduce the potential for contamination of surface and ground waters. The increased septage generated by regular pumping, however, could overwhelm current disposal capacity. Commercial septage is a concern because it is not quantified and may contain hazardous substances such as solvents and photo processing chemicals, as well as grease. Many fear that illegal disposal of septage is already a problem in the state.

7-5-5 Future Management

Much of the state's future growth will occur in areas not served by municipal sewers. Figure 171-7 (1) shows estimates, based on housing units, of the quantities of septage that would be generated with regular pumping. These data and those shown in Figure 171-7 (3) provide a basis for evaluation of treatment plant design plans, plant sizing, and allocation of disposal capacity.

At this time, the Director of DEM has the authority to assign septage to a specific treatment plant on an emergency basis only.

7-5-6 Findings

- Ground and surface water are threatened by improperly dumped septage and by malfunctioning ISDSs.
- Because there is no authority at the state level to ensure disposal capacity or to assign septage to treatment plants except on a short-term, emergency basis, illegal dumping and malfunctioning ISDS's will continue to occur.
- If all ISDSs were pumped regularly as they should be, there would not be enough disposal capacity, particularly if the larger facilities fail to expand their capacity.
- Even if capacity were sufficient, waste water treatment facilities are not obligated to accept septage from outside their service districts.
- Even though septage is disposed at a fee, some facilities are reluctant to accept additional septage.
- Lacking disposal capacity, towns are reluctant to establish waste water management districts and to mandate regular maintenance of ISDS's.

7-5-7 Recommendations

- DEM should have the authority to require that a municipal waste water treatment facility accept septage from outside its service area, based on the facility's permitted capacity.
- Cities and towns should continue to work together to develop a uniform manifest system that will be accepted at all waste water treatment facilities.
- The septage disposal fee should be large enough to cover the treatment facility's actual cost to treat septage and encourage facilities to accept more septage. A uniform fee structure would enable haulers to better calculate their business costs. The Narragansett Bay Commission is required to petition the PUC for rate changes, however, which gives the Commission less flexibility in rate setting.
- The DEM and the Statewide Planning Program should encourage and assist municipalities form regional septage management districts.

In addition, the State Planning Council should continue its work to implement the following recommendations:

- The state Division of Planning should require non-sewered communities to formulate long-range plans for septage disposal as part of the comprehensive planning process (facilities and services element).
- DEM should continue to educate the public to avoid dumping hazardous materials into ISDS's.
- DEM should educate the public concerning proper procedures for inspection and pumping of ISDS's and encourage public involvement with waste water management districts so that septage maintenance is not perceived as just another government mandate.

7-6 SEWAGE TREATMENT FACILITY SLUDGE

7-6-1 Nature of the Material

DEM's regulations define sludge as a residue, partially solid, or solid, treated or untreated, resulting from the treatment of sewage, including such residues from the cleaning of sewers, by processes, such as settling, floatation, filtration and centrifugation, and shall not meet the criteria for a hazardous waste as found in DEM's Hazardous Waste rules and regulations.

7-6-2 Sludge Generation Estimates

Sludge is generated by 19 publicly-owned wastewater treatment facilities. According to the plant operators, the annual sludge production total as of July, 1992 was approximately 32,400 tons of dry solids, an average of more than 88 tons/day. The magnitude of this output can be put into perspective by considering that dry solids constitutes roughly 20 percent of the total sludge weight with water accounting for the remainder. Therefore, the actual quantity of sludge represented by 32,400 tons of dry sludge amounts to more than 162,000 tons/year total wet sludge.

The estimated amount generated by each of the 19 wastewater treatment facilities is presented in Table 171-7 (4).

7-6-3 Federal and State Regulations

a. Federal

The Environmental Protection Agency regulates sludge under its Part 503 Regulations. These regulations require permits for facilities treating domestic sewage. Permit requirements include compliance with existing standards, Part 405 standards and monitoring requirements.

b. State

In May 1991, DEM's Division of Water Resources issued revised sludge disposal regulations. The regulations ensure that sludge and composted sludge from all wastewater treatment facilities that is utilized, disposed or transported in Rhode Island is done in a manner that protects public health and avoids the degradation of the environment. The regulations establish procedures for the treatment, disposal, utilization and transportation of sludge and composted sludge.

In March, 1988, DEM ordered the Corporation to reduce sludge disposal by 75% from the 101,770 wet tons disposed in the previous year to an annual cap of about 25,442 tons. Since 1990, sludge disposal at the Landfill has been reduced by more than 90% from the 1987-1988 disposal level.

7-6-4 Current Management Practices

Currently, most of the sludge generated in Rhode Island is incinerated. Many of the state's wastewater treatment facilities use a publicly-owned, privately-operated sludge incinerator located in Woonsocket as their principal means of sludge disposal. The Woonsocket sludge incinerator has been operating since July 1989, when the facility operator, New England Treatment Company (NETCo), completed a major overhaul of the incinerator and ancillary equipment located at the Woonsocket wastewater treatment facility to take advantage of DEM's 1988 sludge reduction order. Cranston and the Narragansett Bay Commission also burn their sludge in sludge incinerators owned and operated by Cranston and the Narragansett Bay Commission at their wastewater treatment facilities with only a small amount of the unburned sludge allowed at the Central Landfill.

In order to comply with the DEM sludge reduction order, the following initiatives were taken by the Corporation:

- The Corporation has worked with municipalities in regional groupings and individually to facilitate the development of regional sludge composting facilities utilizing the aerated/agitated bin technology by providing grants, technical assistance and coordination and planning services.
- The tipping fee for sludge disposal at the Central Landfill was raised in August 1989 from \$19.00 to \$49.00 a ton to discourage the landfilling of sludge at the Central Landfill and make other alternatives economically viable. The tip fee increase was carefully timed to other alternatives being available for the disposal of sludge.

- The Corporation developed and funded a Sludge Management Alternatives Grants Program for municipal wastewater treatment facilities. This program was funded by the Corporation in the amount of \$200,000 and was designed to provide municipalities and wastewater treatment facility authorities with financial assistance to develop regional sludge management facilities. Three awards were made as follows: \$90,000 to the RI League of Cities and Towns to develop regional composting facilities; \$50,000 to the Narragansett Bay Commission, which serves all or parts of five communities in the metropolitan area and produced approximately 35 percent of the state's sludge in 1988; \$60,000 to Cranston for a feasibility study and engineering design services for improvements to the Cranston sludge incinerator with the idea of possibly serving several communities.

Table 171-7 (4)

WASTEWATER TREATMENT FACILITY SLUDGE PRODUCTION
FACILITY/SERVICE AREA DRY TONS
PER MONTH

HOECHST CELANESE	250.0	
BLACKSTONE VALLEY DISTRICT COMM.		456.3
serves Pawtucket, Central Falls portions of Lincoln, East Prov- idence, Smithfield and Cumber- land		
BRISTOL	87.6	
BURRILLVILLE	25.9	
CRANSTON	250.0	
EAST GREENWICH	10.5	
EAST PROVIDENCE	105.0	
portions of East Providence and Barrington		
JAMESTOWN	*	
4/5 months a year May to October		
LADD SCHOOL	**	
NARRAGANSETT BAY COMMISSION		669.2
serves Providence, North Providence Johnston, and small portions of Cranston and Lincoln		
NEWPORT	166.7	
serves Newport, Middletown, Navy base		
NEW SHOREHAM	1.2	
3/4 months a year June to September		
QUONSET POINT/DAVISVILLE		***
SMITHFIELD	11.4	
SOUTH KINGSTOWN	76.0	
Scarborough sewage plant in Narragansett		
WARREN	41.7	
WARWICK	91.7	
WEST WARWICK	6.1	
WESTERLY	45.0	
WOONSOCKET	197.7	
portion of North Smithfield		
TOTAL	2,492.0 ¹	

¹ Does not include tonnages from Jamestown and QP/Davisville.

* 280-300 wet cubic yds/year

** less than 1/4 dry ton/year

*** 92 dry cubic yds/year

In 1995, composting accounts for only a small percentage of the total sludge disposed of and it is done in only three communities, West Warwick, Jamestown and Bristol.

In 1994, the Rhode Island Attorney General sought a declaratory judgement and injunctive relief to prevent the Narragansett Bay Commission from executing and implementing a sludge management services agreement with a limited

partnership known as NETCO-ER under which NETCO-ER would build and operate a sludge incinerator for NBC. Superior Court Judge Richard J. Israel, in a decision filed in February, 1995, concluded that sewage sludge "is not a solid waste," that sewage sludge incinerators are not subject to this Comprehensive Plan and that the incinerators proposed by NBC are not solid waste management facilities.

7-6-5 Findings

- Since 1988 the landfilling of wastewater treatment plant sludge has been reduced by more than 90 percent.
- While the overall sludge management program in Rhode Island can continue to be improved and refined, the management of wastewater treatment plant sludge in the State has developed systematically so that the sludge generated within the State is now managed entirely in facilities licensed by the DEM.
- As a result of the Superior Court decision of February, 1995, it is determined that sewage sludge is not a solid waste and that facilities that manage sewage sludge are not solid waste management facilities.
- With successful implementation of the Corporation's Gas Recovery Project, the acquisition of most residential properties within 2,000 feet of the operational area of the Central Landfill, and improvements made by the wastewater treatment facilities, odors are no longer a significant problem at the Central Landfill.

7-6-6 Recommendations

- Based upon the February, 1995, Superior Court decision, it is recommended that this Comprehensive Plan not address the management of sewage sludge by the Corporation.

7-7 AGRICULTURAL WASTE

The amount of agricultural waste in Rhode Island, which is the second most densely populated state in the union, is minimal. Agricultural wastes are tightly controlled and in general include animal manures and pesticides.

Dairy cows, pigs and poultry are the major producers of animal waste in Rhode Island. According to figures provided by the state's three conservation districts, thirty-eight dairies operate in Rhode Island, with 3,400 cattle, and there are over 3,400 pigs and 94,000 poultry among various farms in the state. All together farms in the state produce about 73,600 tons of manure per year.

The rising cost of chemical fertilizers has increased the value of animal manure to the point where it is generally stored on site until it can be spread. While animal waste disposal is not an issue, storage may be. Animal waste storage may create runoff pollution or create an odor nuisance. Existing programs of the USDA/Natural Resources Conservation Service, DEM and DOH are sufficient to control nuisance or contamination by animal wastes and to ensure proper management of surface impoundments.

Fertilizer and pesticide disposal in Rhode Island are minor concerns considering the limited extent of agriculture in the state. The high cost of these products deters purchasing in excess, wasteful application practices and indiscriminate disposal. Farmers tend to procure the quantities needed for one season, but should excesses occur, they would be used the subsequent year.

The most serious concern is disposal of fertilizers and pesticides that have been declared unsafe and banned from use but, according to DEM's Division of Agriculture, whichever government agency is involved generally has some regulatory requirement for disposal of pesticides and their residues.

The Department of Environmental Management regulates use and storage of pesticides under the Federal Insecticide, Fungicide and Rodenticide Act and the Rhode Island Pesticide Control Law of 1976 and subsequent amendments. As pesticide wastes are considered to be hazardous wastes, their disposal is subject to the aforementioned statutes as well as DEM's hazardous waste regulations. Beyond this, pesticide disposal has not been considered a problem in Rhode Island.

Cost sharing to farmers for on-site pesticide storage and handling facilities is available through the USDA/Consolidated Farm Service Agency.

Storage of large quantities of pesticides may be regulated by Title III of the Superfund Amendments and Reauthorization Act of 1986, also known as the federal Community Right to Know Law.

a. Findings

- Due to its urban character, Rhode Island does not generate a great deal of agricultural waste. Animal wastes are generally recycled, and the expense of fertilizers and pesticides discourages waste. Because all of these materials are potential water pollutants, they are regulated by the state and/or federal government.
- Due to existing and planned regulatory controls on agricultural wastes these materials are unlikely to become an environmental concern, particularly as they relate to the solid waste stream.

b. Recommendations

- Agricultural wastes currently fall outside the Rhode Island solid waste stream and should continue to do so. None of the three types identified -- animal wastes, fertilizers and pesticides -- fit the definition of solid waste; existing regulation is sufficient to manage these materials.

7-8 HOUSEHOLD BATTERIES

7-8-1 Introduction

The primary waste management concern about household batteries is that they contain metals, including mercury, zinc, silver, cadmium and nickel, that could be leached if landfilled, or enter the atmosphere if incinerated. Of these metals, cadmium and mercury, which pose the greatest health risk, are the focus of this discussion. Although the amount of these metals in each battery is small, the high number of batteries makes the total amount in batteries significant.

Despite the large number of household batteries, it is not now practical to recycle batteries because the cost of recovering constituents such as zinc far exceeds the value of the materials produced.

The seven most common batteries sold to consumers are alkaline-manganese (alkaline), zinc-carbon, mercuric-oxide (mercury), silver-oxide (silver), zinc-air, nickel-cadmium NiCad), and lithium. Each type contains different combinations and concentrations of metals.

Zinc-carbon and alkaline-manganese have the biggest share of the battery market (approximately 90 percent). The use of zinc-carbon batteries is decreasing while the use of alkaline-manganese batteries is on the rise.

Mercury-oxide batteries are in less demand than in the past, while silver-oxide and nickel-cadmium batteries are becoming more popular. Overall, the demand for household batteries is expected to increase with the trend toward a higher demand for high-performance, long-life batteries.

7-8-2 State of the Waste Industry

Almost all household batteries are disposed of with trash. For the majority of household batteries sold in this country no known economically viable recycling technology exists. It is unlikely that cost-effective technology will be developed to recover metals from alkaline or zinc-carbon dry cells, because there is not high-value material in the cells to cover the cost of recovery.

The economics for recovering nickel and cadmium from household NiCad cells could be favorable if they can be collected in sufficient quantities. Unfortunately, this presents difficulties since the majority of NiCad cells in this country are sold to other manufacturers to be built into products. A quarter or less of all NiCads sold go directly to consumers.

The mercury (mercuric-oxide) battery is the only one being recycled in any volume. (Most of the recovered batteries are from industrial, military and medical uses). Recycling these batteries is cost effective because the cost of recovering the mercury is competitive with producing mercury from other sources. However, the mercury button battery, the type generally sold to consumers, is gradually being replaced by the zinc-air and lithium batteries, which have a much lower mercury content.

Silver-oxide cells are also being recycled because the silver has a high market value. However, the number of silver-oxide batteries is relatively small.

7-8-3 State and Federal Regulations

Although the universal waste rule will soon be finalized by the EPA, no state or federal regulations currently address the disposal or recycling of household batteries. However, their heavy metal components fall under the Occupation Safety and Health Act, the Clean Air Act, and the Safe Drinking Water Act. They are also included on EPA's list of toxic pollutants, which are defined as "pollutants which after discharge, and upon exposure, ingestion, inhalation or assimilation into an organism, either directly through the environment, or indirectly by ingestion in food chains, will cause death, disease, behavioral abnormalities, cancer, genetic mutation, physiological malfunctions or physical deformations in such organisms or their offspring."

7-8-4 Current Management Practices

No household battery collection programs operate in Rhode Island. Several small scale programs exist throughout the United States, but none has demonstrated a cost-effective method of removing large amounts of the more toxic batteries without collecting vast amounts of the less problematic alkaline and zinc-oxide cells. Furthermore, most household batteries being collected are not being recycled but are being disposed of as hazardous waste in order to avoid disposal at conventional landfills or incinerators.

7-8-5 Future Management Practices

Managing Mercury in Batteries

The first step toward managing the metals in batteries is to ban the sale of new mercury button batteries, the improper disposal of old mercury batteries, and limit the amount of mercury in alkaline batteries. This proposal appears to be supported by industry, environmentalists and regulators.

Although only 2 percent of the batteries sold in the U.S. are mercuric-oxide (mercury) batteries, these button-type cells account for between 50 and 75 percent of the mercury in batteries, or 25.8 (1989) to 53.9 percent (projected, 1995) of the mercury in municipal solid waste. This is the case because mercury batteries use a mercuric-oxide cathode (as opposed to a mercury coating). Given this design, it does not appear feasible to reduce the percentage of mercury used in this type of battery to less than 40 to 50 percent by weight. The best way to reduce the toxicity of household batteries is to ban the sale and disposal of mercury batteries.

This seemingly extreme measure is feasible since the market share of mercury batteries has been decreasing for at least six years and since zinc-air and lithium batteries are readily available, acceptable substitutes for mercury batteries. (The primary consumer uses for mercury batteries are hearing aids, pacemakers and photography). In fact, the National Electrical Manufacturers Association (NEMA) supports a ban on mercury batteries.

Since 1989, battery manufacturers have made a major effort to reduce the amount of mercury in alkaline batteries. The battery industry is not opposed to laws that will make the present levels of mercury the upper limit for alkaline batteries and support a gradual phase-out of mercury in alkaline cells.

The Rhode Island legislature passed a law "Relating to the Manufacture, Disposal and Recycling of Certain Dry Cell Batteries and Rechargeable Appliances" in 1992. The law mandates the following:

- No alkaline battery larger than a button or coin size shall be sold in the state if it contains more than 0.025 percent mercury by January 1992.
- No alkaline button batteries or coin size batteries shall be sold if they contain more than 25 milligrams of mercury.
- No mercuric-oxide batteries shall be sold in the state after January 1993.

- Nickel-cadmium, mercuric-oxide or lead dry cell batteries or rechargeable consumer products containing nickel-cadmium, mercuric-oxide or lead-acid dry cell batteries should not be disposed of as solid waste.
- Manufactures of nickel-cadmium, mercuric oxide or lead-acid dry cell batteries used by government agencies, industrial or communications facilities or medical facilities should develop a system for proper collection, transportation and processing of waste batteries in Rhode Island.
- All rechargeable consumer products manufactured on or before July 1993 that contain a nickel-cadmium or lead-acid dry cell battery should be designated so that the battery can be easily removed by the consumer and labeled indicating that the battery should not be disposed of in the municipal solid waste stream.
- The Rhode Island Department of Environmental Management has developed draft regulations and should promulgate final regulations for dry cell battery recycling and work with industry to establish such a program in 1995.
- All nickel-cadmium, mercuric-oxide and lead-acid dry cell batteries sold in the state should be labeled recyclable with information on how consumers can get information on recycling.

Managing Cadmium in Batteries

In the long run, a program to require NiCad batteries to be removable from small appliances would make it easier to recycle these cells. However, since it is not likely that it will be cost-effective or necessary to recycle other types of batteries, a major effort would be necessary to educate consumers to recycle only NiCads. Given that all Rhode Island incinerators will have state-of-the art emissions controls and that all future landfills will be lined, a NiCad collection program will be a low priority.

7-8-6 Findings

- The toxic content of batteries containing mercury and cadmium is the primary reason to consider controlling the disposal of batteries in trash.
- The most common types of batteries are generally not recyclable because there is little of value in them. In addition, collection would be very expensive.
- Mercury batteries should be banned because they pose the greatest health risk and because comparably priced substitutes are available.
- A collection program for NiCads, designed to remove cadmium from the waste stream, is not advisable at this time given that 75 percent of these types of batteries are built into appliances and that the health risk from landfilling or incineration is controllable.

7-8-7 Recommendations

- Batteries containing significant amounts of mercury should be kept out of the solid waste stream.
- The state should monitor the disposal of nickel-cadmium batteries, work toward making these batteries removable from household appliances, and be ready to implement a collection and recycling program if future estimates of health risks are determined to be higher than currently believed.
- The state should promote research into non-toxic or less toxic types of batteries as well as rechargeable and long-lived batteries and should continue its efforts to involve manufacturers in the disposal/recycling process. It will be necessary to work with regional and national organizations to ensure that these issues are dealt with at the national level.

7-9 MOTOR VEHICLE BATTERIES

7-9-1 Introduction

It has been recognized that motor vehicle batteries may be difficult for vehicle owners to dispose of, and pose health and safety and environmental concerns if improperly disposed of.

7-9-2 State Regulations

In 1988, to encourage proper disposal and recycling of motor vehicle batteries, the Battery Deposit & Control Act of 1987 was amended. The Act requires that a \$5.00 deposit be collected by dealers at the time of the purchase of a new motor vehicle battery. Payment of the deposit is waived when a used, recyclable motor vehicle battery is delivered to the dealer. Deposit funds that are collected are maintained by the dealers in trust.

Dealers, distributors, manufacturers, and battery recyclers are required to file annual reports with DEM regarding battery inventory, sales, and recycling activities in the previous year. Dealers must submit with their annual reports \$4.00 for every battery deposit collected during the filing period, from funds held in trust. Battery deposits received by DEM are used to fund program administration expenses of the program.

Battery recyclers are licensed by DEM, and the licenses must be renewed on an annual basis.

7-9-3 Current Management Practices

Used motor vehicle batteries may be disposed of through motor vehicle battery recyclers. Because of the value of the recycled lead in motor vehicle batteries, they can normally be disposed of through licensed battery recyclers by vehicle owners at no cost to them.

7-10 USED OIL COLLECTION AND MANAGEMENT

7-10-1 Introduction

Used oil means a petroleum-based oil which, through use, storage or handling, has become unsuitable for its original purpose.

In recent years, a substantial increase in the number of individuals who perform oil changes at home has been documented. More than 70 percent of the motor oil sold in the United States is purchased by individuals who change the vehicle oil themselves, yet most of these individuals are unaware of the dangers to the environment and public health from improper disposal of used motor oil. As a result, significant amounts of used motor oil are discarded in an unacceptable and often illegal manner into a trash receptacle, onto the ground, or into sewers, storm drains, ponds or streams.

Lacking a consistent regulatory framework, options for used oil recovery vary throughout the country, although all of them share a commitment to public education. Options for used motor oil recovery include: curbside collection; state, county, or community-based drop-off programs; voluntary drop-off programs; retailer return programs; and household hazardous waste collections. Because of the expense of hazardous waste transport, storage, and disposal, recovery of used motor oil through other programs is increasingly important.

7-10-2 Quantity

An estimated three million gallons of used industrial oil and over six million gallons of used motor vehicle oil are generated in Rhode Island annually. Industrial waste oil consists primarily of lubricating fluids from industrial processes. Although often high in heavy metals, industrial waste oil is burned as a heating fuel and may be utilized in the manufacture of asphalt. Most industrial waste oil is recovered by industry.

Used oil from motor vehicles also contains lead and other heavy metals, but it is, for the most part, a recyclable resource with approximately the same heat value per pound as virgin oil. It is often contained at the time of its removal from a

vehicle, and requires only an accessible, environmentally sound collection system.

7-10-3 Legal Framework

RIGL §23-19.6 requires collection and recycling of used oil to the maximum extent possible, by means that are economically feasible and environmentally sound. The stated goals are to conserve petroleum resources, preserve and enhance the quality of the environment, and protect public health and welfare.

RIGL §23-19.6 (enacted 1980, revised 1985) defines and describes state policy on used oil recycling:

Used oil is defined as a hazardous waste, subject to the Hazardous Waste Management Act of 1978; the Water Pollution Law, Chapter 46-12; and the Air Pollution Law, Chapter 23-23; and any subsequent regulations. Generators may choose to complete the hazardous waste manifest and follow the appropriate reporting procedures. As an alternative, the transporter may use the waste automotive oil manifest, leaving a receipt with the generator as proof of proper disposal.

The manifest includes the name of the transporter, the date of the shipment, the quantity of the oil, and its destination. Waste automotive oil logs are submitted to the Department of Environmental Management monthly and the records retained for a period of three years after delivery.

7-10-4 Current Management Practices

In 1980, service stations participated, voluntarily, in a used motor oil collection system which failed as the economics of waste oil recycling deteriorated. By the fall of 1986, only one facility, the state-owned and operated Central Landfill, accepted up to five gallons of used motor oil at no charge.

In November 1988, Rhode Island initiated an improved program for the collection and recycling of used motor oil at no cost to private citizens who change their own oil, that is safe and convenient. The program is a joint effort of DEM and the municipalities.

The state provides to each community an on-site, user-friendly, specially-designed, self-contained collection containers, which hold 165 to 480 gallons of oil depending on type. The state purchased 40 Kotrac igloos at a cost of \$1,800 each in 1988, and an additional three double walled steel containers in 1990 at a cost of \$2,500 each.

Limited financial assistance for site preparation and placement of the collection container is provided by the State, which also pays a waste oil contractor to pump out the waste oil containers.

Each participating community must repair and maintain its container and clean and maintain the surrounding area to avoid public health or environmental problems.

Municipalities monitor container use and ensure spill containment and clean-up, ensure waste oil only is deposited in the container, and ensure compliance with laws, removal of oil and site security. Disposal is limited to five gallons per person and use of the facilities by commercial sources is prohibited.

The municipality is responsible for overseeing oil sampling and testing procedures specified by DEM, to determine if the oil is contaminated. Municipalities are responsible for the costs of disposing of contaminated oil and containers brought to the site by residents.

The initial start-up costs for this program were \$200,000, half of which came from the DEM OSCAR Program and the other \$100,000 from Oil Overcharge Funds administered by the Governor's Office of Housing, Energy and Intergovernmental Relations. Long-range funding will be derived from the tax provisions of the Hard-to-Dispose-of Law, which began in January 1990. This law imposes a tax of five cents per quart or five and 3/10 cents per liter on lubricating oils, collected upon sale from wholesaler to retailer.

Thirty-six communities participate in the program, using thirty-four collection sites. Narragansett participates in the program through the use of the South Kingstown collection site and Hopkinton participates through a regional recycling

program with the Town of Westerly. The Towns of North Kingstown and Jamestown do not participate in the DEM program, but maintain their own waste oil collection programs for their residents. The Town of North Providence has signed an agreement for participation in the program, but has yet to select a collection site location. Therefore, thirty-eight communities presently participate in the DEM program, or maintain collection programs of their own.

The program has collected and recycled 778,144 gallons of used motor oil as of September 30, 1994.

7-10-5 Findings

- The DEM Waste Oil Collection & Used Oil Filter Collection & Recycling Program has proven to be very popular with residents, widely implemented by communities, cost-effective, safe to operate and successful in the collection of waste oil for recycling purposes.
- As more communities participated and residents learned of the program, volumes of waste motor oil collected increased rapidly in the early 1990's. Waste motor oil collection volumes continue to increase, but at a much slower rate.

7-10-6 Recommendations

- With the Town of North Providence being the only community in Rhode Island without a community based collection site, that community should be encouraged to complete its site selection program and begin program implementation.

Public education programs should be expanded to increase awareness by residents of the availability of the program, increase awareness of public health dangers and environmental consequences of improperly disposed waste motor oil, and, thus, increase the use of the Waste Oil & Used Oil Filter Collection & Recycling Program.

7-11 USED OIL FILTER RECYCLING

7-11-1 Introduction

Used oil filters are broken down into three components, each of which can be recycled or used. DEM's Waste Oil & Used Oil Filter Collection & Recycling Program collects used oil filters. Oil is recovered from filters and sent to fuel blending facilities. The spent filter media is sent to a treatment facility which incinerates the material and uses the heat from the process to generate electricity. The steel is used in steel mill operations.

7-11-2 Findings

- Collection rates have increased dramatically with 1000 used oil filters collected and recycled during the July 1, 1992 - September 30, 1994 time period and 4800 used oil filters collected and recycled during the July 1, 1994 - September 30, 1994 time period. From the program inception through September 30, 1994, 27,600 used oil filters have been collected and recycled.
- As this program is relatively new in comparison to the waste oil component of the program, and residents are still becoming aware of the service, collection rates are increasing more rapidly than collection rates on the well established oil collection program component.

7-11-3 Recommendations

- The six communities which participate in the waste oil collection component of the program, but do not participate in used oil filter collection, should be actively solicited to become participants in that aspect of the program.
- Public education is needed to increase awareness of the availability of this service, as well as educating the public on procedures such as the proper draining, storing and transporting of used oil filters to collection sites.

7-12 HOUSEHOLD HAZARDOUS WASTE

7-12-1 Introduction

Public education and increasing awareness of environmental issues, due in large part to efforts to get residents to reduce and recycle their household trash, has made the demand for environmentally sensitive disposal of home toxics the next step in the process of implementing an integrated solid waste management hierarchy.

Household hazardous waste constitutes a portion of the hazardous waste stream which is unregulated by the U. S. Environmental Protection Agency (EPA). National statistics indicate that up to 1.5% of municipal solid waste is household hazardous waste.

7-12-2 Past Management Practice

The Department of Environmental Management (DEM) has a long standing, demonstrated commitment to the proper handling of household hazardous wastes. In 1984, DEM sponsored its first "Toxic Waste Cleanup Day". Since that time, DEM has sponsored thirty-nine (39) household hazardous waste cleanup days, serving over 13,930 Rhode Island households.

Cleanup days have served residents of all thirty-nine (39) cities and towns in the State of Rhode Island, with a population of approximately one million. One to five cleanup days per year have been held since 1984. Funding for the cleanup days came from the General Fund for the first two years, from the Environmental Response Bond Fund from 1986 to 1991, and from the Hard-to-Dispose Fund from 1992 to the present.

The drive-through arrangement used at cleanup days has allowed vehicles to be unloaded, and hazardous wastes placed on tables separating the waste receiving area from the waste handling area. In the waste handling area, a hazardous waste contractor has packaged wastes for shipment for treatment or disposal. Recycling, treatment or incineration of wastes have been preferred methodologies as opposed to landfilling, wherever feasible.

The Rhode Island program for household hazardous wastes has provided an opportunity for proper disposal of the waste items collected, and limited public education. Problems and limitations of the one day collection program have included:

- Cost per participant at cleanup days has increased almost four-fold since 1984. Infrequency of cleanup days, requiring households to store household hazardous materials for months, and creating a problem for residents that are moving and have household hazardous wastes to dispose of.
- Lack of ability in predicting participation rates at cleanup days, as well as the times of day when large numbers of participants will arrive within a short period of time, creating long lines, delays in processing wastes, and traffic problems.
- Lack of ability to predict the types and amounts of waste that will be collected at any one location, and the treatment or disposal costs for those wastes.
- Very limited options for reuse or recycling of wastes collected.

These items were distinct factors in the decision to proceed with planning and development of a permanent household hazardous waste facility, as well as the passage of the Hard-to-Dispose Material Law as a funding source for the permanent program.

7-12-3 Current Management Practices

DEM has been committed to a permanent household hazardous waste collection system, which would:

- Provide an on-going, convenient system for residents to properly dispose of household hazardous wastes.
- Be far more cost effective and predictable than one day collections, since set up costs would be minimized, and since all drums could be filled to capacity and stored before shipment for treatment or disposal.
- Allow greater flexibility for the reuse and recycling of wastes.
- Provide far greater informational and educational opportunities with the public.

It has been clear from the high resident participation at one day collections that a permanent household hazardous waste collection facility would be well utilized by the service population.

Increased participation rates could result in increased volumes of waste requiring disposal, but these disposal costs would be at least partially offset by the ability to reuse or recycle as much of the waste as possible.

DEM has constructed a permanent household hazardous waste collection facility, located on Narragansett Bay Commission property at Fields Point in Providence, completed in the spring of 1995. It will serve residents of all thirty-nine cities and towns. Approximately two-thirds of the population of Rhode Island lives within twelve (12) miles of the facility location.

The facility is expected to open in the spring of 1995. The facility will use an appointment system, which will minimize waiting by residents when they arrive at the facility, and it will allow DEM far greater control over its budget. DEM plans to open the facility for collections on two Saturdays per month during the spring, summer and fall months.

A hazardous waste contractor (transporter) will be responsible for management, operations, transportation and disposal, and staff training functions at the facility. DEM will schedule appointments, complete registration forms, and oversee contractor operations during each day of operation. In cooperation with and in conjunction with the contractor, DEM will develop and implement the public education component of the program.

Typical household wastes to be accepted include paints, solvents and thinners, pesticides, household cleaners, swimming pool and hobby chemicals, automotive waste oil and antifreeze.

Household hazardous wastes only will be accepted. No commercial or industrial hazardous or non-hazardous waste can be accepted at the facility. consequences. use and reuse of recycling materials.

7-12-4 Findings

- Household hazardous waste is not regulated by the U.S. EPA as a hazardous waste.
- The public needs to be educated about the products that they purchase and use in their homes so they can be responsible for the proper use and disposal of toxics, as well as alter future product purchasing. This should include information on source reduction, reuse and recycling of materials.
- Long term consequences of storage of unwanted products in homes or improper disposal of these products has environmental as well as health and safety considerations. A permanent household hazardous waste collection program is the best way to minimize these consequences.

7-12-5 Recommendations

- Waste diversion should be emphasized to the maximum extent possible. A waste management hierarchy of recycling, treatment, and disposal should be followed when shipping wastes off site.
- The public information and education component developed as part of the permanent household hazardous waste program should place a strong emphasis on source reduction, reuse of products, and recycling.
- If the demand by residents is such that the number of collection days is not adequate for service within a reasonable period of time, additional funding sources should be investigated to add days of collection to the schedule.
- For automotive waste oil and used oil filters, residents should be encouraged to continue to use the community based waste oil and used oil filter collection sites, provided under the DEM Waste Oil & Used Oil Filter Collection & Recycling Program.

171-8 FINANCING COST IMPACTS OF THE SYSTEM

8-1 INTRODUCTION

The mix of source reduction, recycling, composting and landfilling projected in Section 171-5 assumes that certain programs and facilities are in-place or will be developed. For the most part, those programs and facilities are in-place. Specifically, source reduction programs are well established, and although they may evolve and expand, there is no new infrastructure to develop; the expansion of the MRF that is currently underway will allow for the growth of municipal recycling that is projected; yard waste composting infrastructure is continuing to develop, at the Landfill, at municipal sites and at private facilities; and a plan for the phased development of landfill capacity has been established by the Corporation. The biggest component of the projected solid waste management system that is not in-place or planned is commercial recycling. While commercial recycling is well established, the infrastructure necessary to support the large increases in commercial recycling that are projected is not in-place. However, this infrastructure has and will continue to be developed by the private sector, in response to demand for these services.

Thus, there is relatively little solid waste management infrastructure currently planned that requires public financing. The two major components of the publicly-financed solid waste management system are the Landfill and the expanded MRF. The development and financing of these facilities are being managed by the Corporation, and the costs associated with these facilities are described generally in this section. Certain other facilities are being considered for future development, and the potential costs for those facilities are also described herein.

It is important to recognize that the costs for those facilities developed by the Corporation vary significantly over time and cannot be predicted with a great deal of certainty. For instance, the costs associated with the Landfill are affected by the tonnage received, agreements with the host community and consent agreements regarding superfund remediation. Each of these factors varies over time. The net costs of the MRF are greatly affected by material revenue, which varies over time and is very difficult to predict.

The costs for those facilities and programs which are developed by entities other than the Corporation (e.g. municipalities or the private sector) can be projected with even less certainty. As a result, the costs for Corporation-sponsored facilities are only described generally herein and the costs for non-Corporation facilities and programs are described for only those which are significant in relation to this Plan. To attempt to do otherwise would result in quickly outdated and potentially misleading projections. For instance, a detailed review of Corporation financial projections reveals that in the course of a month changes on the order of several millions of dollars a year occur based on updating the projections to reflect continuously changing conditions. Therefore, only more generalized projections are presented herein.

Thus, when one discusses implementation of the solid waste management system, it is really a matter of understanding the economic impacts of a system that is in-place or being implemented right now. The two key components of the system are the Landfill and the soon-to-be-expanded MRF. Thus, this section focuses on economic analysis of this system, and discusses some of the potential economic impacts of facilities or programs that could be implemented in the future.

8-2 PROJECTED COSTS FOR SOLID WASTE MANAGEMENT SYSTEM

Programs and facilities managed by the Corporation are most affected by this Plan, and also form the foundation for most of the solid waste management activities discussed in the Plan. However, it is important to recognize that there are certain key activities that are not within the Corporation's control, and thus are not included in any cost projections prepared by the Corporation. These include the following:

- Collection of trash and recyclables, except to the extent the Corporation subsidizes municipalities' recyclables collection costs.
- Commercial recycling, except the costs associated with commercial recyclables that are expected to be processed at the Corporation's MRF.
- Yard waste composting programs implemented by municipalities or private entities.
- Management of solid waste not handled within the Corporation's system (i.e. exported or managed at non-Corporation facilities within the State.)

The two major cost items for the Corporation are the Landfill and the MRF, although there are other costs for such things as the source reduction activities of the Corporation, and public education efforts. The major cost categories are described below, along with a general sense of the magnitude of the current costs in each category.

8-2-1 Landfill Costs

Labor: All of the labor costs, including benefits, associated with staff that actually operate the Landfill are included in this category. Current costs are approximately \$3.5 million per year.

Operation and Maintenance: Costs such as fuel and parts for buildings and equipment at the Landfill are included in this category. Currently this accounts for in excess of \$2 million per year in costs, although this category would vary depending on tonnage received.

Depreciation: This category captures the amortized costs associated with all capital expenditures. By depreciating each piece of equipment and each building over its applicable useful life, the annualized costs of equipment and buildings is reflected. This depreciation covers all principal payments on any long-term debt, as well as equipment replacement requirements. Depreciation currently accounts for slightly less than \$3 million per year, but this will escalate with the expansion of the MRF.

General and Administrative: All of the "overhead" costs of the Corporation (such as rent and labor costs for personnel not directly involved in recycling or the Landfill) are included in this category, which currently accounts for in excess of \$2 million per year.

Interest: The interest paid on long-term debt is included in this category. Since the long-term debt held by the Corporation is not associated with financing of a particular project, all of the interest costs may not be strictly associated with the Landfill. Total interest costs are approximately \$1.5 million per year. This cost will change over time depending on how long-term debt is retired and interest rate trends.

Post-closure Costs: Funds have been created to ensure that sufficient money is available for post-closure care after the Landfill is closed. This category represents the contributions that are made to the funds each year, which are approximately \$1.4 million.

Superfund-Related Costs: As part of the consent agreement to operate the Landfill, certain mitigation measures must be conducted on property owned by the Corporation. Thus, these costs represent one of the financial requirements in order to

be able to operate the Landfill in its existing location.
Currently these costs are approximately \$2.5 million per year.

Host Community Fee: This category includes the costs of payments made by the Corporation to the Town of Johnston. As with Superfund clean-up costs, these are part of the costs of operating the Landfill at this site. These costs are currently in excess of \$1 million per year.

Cover Material: Since the purchase of cover material is a very significant operating costs, it is included in its own category. It currently cost about one-half million dollars per year for cover material, but this cost varies with tonnage received.

Other Costs: All other costs associated with the landfill are included in this category. These costs include contracted services, certain improvement projects at the Landfill and operation of the pretreatment facility for leachate from the Landfill. These other costs currently total approximately \$6 million, but are likely to decrease over time as improvement projects are completed.

Interest Income: There are a number of funds, including those for post-closure costs, that have been established. These funds bear interest until such time as the money is utilized for its intended purpose, and this category projects the level of interest income that these funds will generate. Currently, in excess of \$1.5 million in interest income is generated annually.

Methane Royalty: In exchange for allowing a private company to utilize the methane generated at the Landfill for the generation of electricity, the Corporation receives a royalty payment. The projected royalty payments are reflected in this category, which accounts for approximately \$700,000 in income.

Real Estate Income: In accordance with State mandates, the Corporation purchased much of the land and property in a buffer zone around the Landfill. Some of this property generates rental income which is currently in excess of \$200,000 per year.

8-2-2 Recycling Costs

MRF Operating Contract: Based on the terms of the operating contract and the projected tonnage at the expanded MRF, the fees to be paid to the MRF operator are projected. This cost will vary depending on tonnage, but is projected to be between \$2.5 and \$4.5 million per year.

Recycling Staff: Includes labor costs and fringe benefits for all Corporation staff involved in the administration of the Corporation's source reduction and recycling programs. This cost is currently approximately \$750,000 per year.

Depreciation: See discussion of depreciation for Landfill.

General and Administrative: See discussion of G & A costs for Landfill.

Interest: See discussion of interest for Landfill.

Revenue Share/Grants: The Corporation expects to continue to subsidize the incremental costs of recyclables collection borne by municipalities beyond the time period in which it is mandated to do so. These subsidies would be through some form of revenue sharing or grants. The exact level of this revenue sharing would depend on all costs and revenues actually incurred, but is anticipated to be on the order of \$1 million per year.

Special Projects: This category includes an allocation for projects, such as the Foster intensive recycling project, that are consistent with the goals of this Plan. The costs are estimated to be approximately \$100,000 per year.

Public Education: An allocation for public service announcements and other forms of public education is included since this type of public education is necessary to sustain high levels of recycling. The costs for public education are estimated

to be approximately \$250,00 per year.

Material Revenue: The sale of recyclables generates considerable revenue that offsets some of the costs of the recycling program. Since each of the recyclables handled at the MRF is a commodity, and the prices for these commodities vary substantially over time, it is difficult to project material revenues with a high degree of precision. This is particularly true because both the mix of materials and the nature of the marketplace for those materials is somewhat uncertain. Given this uncertainty, material revenues between \$2 and \$5 million per year are reasonably expected with revenue levels outside of that range possible.

8-2-3 Total Costs

Given the uncertainty in many of the cost and revenue categories described above, the range of possible total costs is rather large. However, in the next few years it is likely that total costs for Corporation-sponsored facilities and programs will be between \$20 and \$25 million per year.

8-3 FINANCING THE SYSTEM

The primary means by which the solid waste management system will be financed is through tipping fees at the Landfill. Although some tipping fees will likely be received at the MRF (from commercial recyclables) and there may be some grant funds or other sources of funds, it is anticipated that the vast majority of the net costs identified in Section 171-8-2 will be covered through tipping fees received at the Landfill. In addition, although the Corporation currently holds long-term debt and will likely continue to do so, no project-specific financing are anticipated. As a result, this discussion of financing the system does not need to address the requirements for project financing, but instead addresses the requirements for tipping fee revenue to support the anticipated costs of the solid waste management system.

The number of tons anticipated to be handled at the Landfill and the MRF are important not only because of the impacts on operating costs, but also because in the case of the Landfill the number of tons received affects the revenue that the Corporation receives.

It is important to recognize that with relation to commercial waste the quantity of waste received at the Landfill is dependent on, among other things, the generation of commercial waste, the tipping fee established for commercial waste at the Landfill, the tipping fees at disposal facilities in the surrounding region, and the disposal capacity available in the surrounding region. The interplay between these factors is well illustrated by the significant increase in commercial waste disposed during 1994, as discussed in Section 171-5. The quantity of commercial waste disposed in the last half of 1994 was roughly twice that received during the first half of 1994 as a result of actual and impending reductions in disposal capacity in the surrounding region which, in turn, increased tipping fees in the surrounding region. In addition, some increase in commercial generation probably occurred simultaneously with these other events. This caused the \$37 commercial tipping fee being charged at the Landfill to become much more competitive in the latter half of 1994, resulting in a reduction in waste exports.

This is indicative of how the setting of the commercial tipping fee can have a significant impact on the quantity of waste received at the Landfill. Thus, the Corporation must balance the need to maintain cost-effective disposal options for Rhode Island businesses with the needs for revenue to support the solid waste management system, while at the same time adjusting, as necessary, to the competitive nature of the waste disposal marketplace and the fact that capacity and tipping fee changes in the region can affect the quantities of waste received at the Landfill.

At the present time, the primary "competition" for commercial waste disposal comes from facilities in Southeast Massachusetts. There are currently a number of facilities with closures planned within the next several years, as well as proposals for new or expanded disposal facility development. Based on the policies and guidelines for needs assessment in Massachusetts, it appears likely that the net result of closures, expansions and new facilities is a decrease in total disposal capacity available in Southeast Massachusetts. As a result, the opportunities for export of commercial waste from Rhode Island are likely to decrease and the tipping fees that would have to be paid are likely to increase, resulting in an environment where the Corporation can maintain its commercial tipping fees at levels at or above the current rates while still receiving most of the commercial waste generated in Rhode Island.

In addition to recognizing the relationship between commercial tipping fees charged and tonnage received, the ability of tipping fees to play a role in extending landfill life must also be included in decision-making regarding setting tipping fees. Given the fact that landfill space is, in some sense, a non-renewable resource, and the difficulty and expense of identifying, licensing and permitting new landfill space, one of the goals of solid waste management in Rhode Island is to extend the life of the Landfill. Since commercial tipping fees play a role in determining the quantity of commercial waste received they can, in turn, affect the life of the landfill.

Thus, the process of setting commercial tipping fees must balance all of the following factors:

- the requirement to maintain cost-effective disposal;
- the need to fund existing and planned programs and facilities;
- the fact that the relationship between the commercial tipping fees at the Landfill and those at other disposal facilities in the region will affect the tonnage received; and
- the desire to extend the life of the Landfill.

By taking all of these factors into account, the tipping fees established will support many of the objectives of the Plan.

8-4 OTHER PROGRAM/FACILITY COSTS

The purpose of this section is to discuss in a qualitative manner the costs for those programs and facilities not included in the financial projections described above. The non-Corporation facilities and programs in the state include collection of

trash and recyclables and costs associated with commercial recycling (except for the costs of processing some commercial recyclables at the MRF). These services will be provided by such a large number of entities (public and private) in such a wide variety of ways that there is no point in speculating regarding their costs.

Another category of cost that was excluded is the cost associated with composting of yard waste, except for that relatively small portion of the total that is accomplished at the Landfill. The composting of yard waste will also be executed by a large number of entities, and there may be significant variations in the manner in which this material is collected, which can have a significant impact on costs. In general, centralized composting of yard waste has been found to cost approximately \$25 per ton, excluding any collection costs.

Composting of food waste is assumed in the projections of waste quantities composted and recycled in the later years of the projection. The manner in which this will be accomplished is unclear, but could include co-composting with yard waste and/or sludge, or composting of that material in a dedicated facility. Another possibility is that separately collected food waste could be included as a supplemental feedstock to a mixed waste composting facility, if one were developed (see below for a discussion of mixed waste composting). It is also possible that by the time food waste composting is assumed to occur in a significant fashion (in the 2005 to 2010 time frame) that so-called wet/dry collection systems will be in place, allowing composting of all organic material together in facilities designed for this segment of the waste stream.

There are a number of other programs or facilities that have been given detailed consideration, and for which cost estimates have been developed. These are described below:

Open Top Trailer Transfer Station: The Corporation has been considering the construction of transfer station at the Landfill that would allow vehicles to transfer waste to open-top trailers that would then transport the waste to the operating face of the Landfill. This would allow more efficient turn-around for vehicles delivering waste to the Landfill, since they would not be required to travel to the working face. This potentially faster turn-around time is very important to commercial haulers, in particular, since the time spent at the Landfill directly affects their costs of operation. Thus, improving turn-around time at the Landfill may increase commercial tipping fees received, either due to increase tonnage received, or the ability to charge higher tipping fees.

In addition, the transfer facility would be designed to allow separation of commercial waste loads for recycling. In analyzing the feasibility of this type of facility, the Corporation has assumed that it would be designed to receive 3,000 tons per day of waste, half of which would be municipal and half of which would be commercial. The Corporation has estimated the capital costs for the building and equipment to be approximately \$7.8 million dollars, and the operating costs to be \$1.5 million per year.

If the cost of the building and tipping areas is depreciated over 20 years and the equipment is amortized over 5 years (in the same way that capital costs are amortized in the analysis of Landfill and MRF costs described earlier), the annual cost for the transfer facility building and equipment would be approximately \$870,000. Adding that to the operating costs raises the total annual costs to approximately \$2,419,000. Assuming that no increase in tonnage results from construction of this facility, and that there is no offsetting material revenue, this facility would increase the cost of landfilling by approximately \$3.70 per ton, based on 650,000 tons per year. In fact, it is likely that more commercial waste would be received as a result of construction of the transfer facility, since it would decrease turn-around time. In addition, it is anticipated that between 150 and 200 tons of commercial recyclables would be recovered. If 150 tons per day of commercial recyclables are recovered and marketed for \$40 per ton (a conservative estimate) this would generate in excess of \$1.5 million of revenue, reducing total costs to approximately \$860,000 per year, or \$1.30 per ton. The per-ton estimates are particularly conservative because they assume only 650,000 tons per year of waste disposed.

Construction and Demolition Processing: In response to the increasing demand to recycle components of the construction and demolition (C & D) waste stream, the Corporation has analyzed the feasibility of constructing a C & D processing facility. In analyzing the economics of a facility of this type, a facility that could process 200 to 300 tons per day was assumed. The facility would contain the equipment necessary to process for recovery a wide variety of materials from the C & D waste stream, with the goal of recycling virtually all of the material received. The capital cost for a facility of this type was estimated to be \$2.4 million, with an annual operating cost of approximately \$830,000. First year tipping fees were estimated to be between \$15 and \$23 per ton, not accounting for any revenue or savings from generation of material

that could be used as cover at the Landfill. (See "Construction and Demolition Debris Recycling Facility Feasibility Study, Final Report", Wehran Engineering Corporation, July 1994 for more detailed information).

Mixed Waste Composting: The six communities in Newport County are considering the development of a mixed waste composting facility to handle all of their waste, with the potential for recovery of recyclables and compost. This project is still under development, and as a result, its costs are not known. However, tipping fees for recently developed projects of this type have generally been between \$60 and \$75 per ton. It is also important to note that facilities designed to compost mixed solid waste have had a varied history, with some projects being unable to operate on a long-term basis due to economic or technical problems.

Representatives from some of the communities involved in the development of this project have indicated that the desire to pursue this project is primarily economic. To the extent that this project offers potential economic advantages to the participating communities, these advantages stem from the ability of the communities to eliminate source-separated curbside collection of recyclables and the elimination of long-distance haul of recyclables and trash to the MRF and Landfill, respectively. The intention is to recover recyclables through the proposed facility, although elimination of source-separated collection would require changes to existing legislation. The elimination of long-distance haul would, obviously, reduce costs for the communities, although this benefit would be provided regardless of the type of facility developed.

8-5 FINDINGS

Some of the key findings regarding the financial impacts of solid waste management in Rhode Island are as follows:

- the Landfill and expanded MRF form the foundation of the solid waste management system and represent the two largest cost centers.
- The costs for the Landfill and the expanded MRF are relatively well known, but forecasting the costs for these facilities involves considerable uncertainty because of the large number of factors outside of the Corporation's control that affect costs.
- Total costs for Corporation-sponsored facilities and programs are likely to be between \$20 and \$25 million per year over the next several years.
- Costs for most non-Corporation facilities and programs are controlled by so many entities and vary so substantially from location-to-location and situation-to-situation that they cannot be accurately characterized.
- Two facilities under consideration by the Corporation for future development are an open-top trailer transfer station and a construction and demolition processing facility. Costs are expected to be between \$1.30 and \$3.70 per ton for the transfer station and between \$15 and \$23 per ton for the construction and demolition processing facility.
- A mixed-waste composting facility is being considered by the six communities in Newport County and although the costs for that potential facility are not known, costs for similar facilities have generally been between \$60 and \$75 per ton.
- The costs for the Corporation's facilities are dependent on, among other things, the quantity of waste received.
- The quantity of commercial waste received at the Landfill is affected by the tipping fee charged for disposal of commercial waste.
- The Corporation does not currently, and is unlikely in the future, to have control over municipal tipping fees.

8-6 RECOMMENDATIONS

The following are recommendations regarding fiscal policy that can support the goals and objectives of the Plan:

- The Corporation should maintain a zero tipping fee for municipal recyclables delivered to the MRF, to the extent it remains consistent with fiscal solvency, in order to maximize the financial incentive to recycle.
- In setting commercial tipping fees, the Corporation should consider:
 - the relationship between its tipping fees, those for other disposal facilities in the region, and the quantity of waste it receives;
 - the need to generate revenues sufficient to keep the Corporation fiscally solvent;
 - the need to fund programs, facilities and activities recommended in this Plan;
 - the desire to extend the life of the Landfill; and
 - the need to provide cost-effective disposal for Rhode Island's businesses.

8-7 MUNICIPAL FINANCING OF SOLID WASTE

8-7-1 Introduction

Thirty-four of the State's 39 communities currently finance municipal solid waste collection and disposal costs through property taxes or a flat rate sticker fee for unlimited service. With both approaches, a household's payment is fixed regardless of the amount of solid waste disposed. Moreover, with the property tax, residents do not see a bill and generally have no idea how much it costs to remove their garbage every week. There is no incentive to reduce waste or to recycle. In addition, under this system the residents who produce a small amount of waste subsidize those who generate larger amounts.

As an alternative, municipalities are exploring financing strategies which provide incentives to maximize reduction and recycling. One such system is pay-as-you-throw (also known as user fee, variable-rate pricing and pay-by-the bag), a system under which residents pay for municipal waste management based on the amount of trash they place at the curb or drop off at disposal facilities.

Unit pricing supports the waste management hierarchy defined by RIGL 23-19 by creating an economic incentive to reduce waste, recycle and/or compost as much as possible before disposal. Some communities with user-fee programs report reductions of 25 to 45 percent in the amount of waste shipped to disposal facilities and that recycling programs divert eight to 13 percent more waste by weight.⁶ User fees provide a more equitable waste management fee structure. Under a user-fee system residents are charged for what they use and have greater control over the amount of money they pay.

Pay-as-you-throw systems can be assessed on weight, volume, or some combination of the two. There are several options:

- Variable can system: The customers are billed on the number and/or size of cans subscribed or set out;

⁶United States Environmental Protection Agency, Pay-As-You-Throw: Lessons Learned About Unit Pricing, April 1994, p.3

- Prepaid bag system: The customers buy special garbage bags with logos;
- Prepaid tag or sticker system: Customers purchase tags or stickers that are attached to the waste set out for collection and disposal
- Hybrid system: The base level of can or bag/tag service is funded through taxes or fixed fees, with increments to that service paid through a variable rate system such as bag or tag/sticker systems;
- Weight-based systems: Households are charged per pound waste disposed.

In 1990, DEM commissioned a Brown University study which recommended that each resident and business pay the full cost of managing solid waste through a user-fee program. The recommendation to implement a user-fee program was also made in 1992 by the Governor's Select Commission on the Future of Solid Waste Management in Rhode Island.

One common concern regarding pay-as-you-throw is the potential incentive for increased illegal dumping. Interviews with a number of communities that have implemented these programs indicate that increased illegal dumping has mostly been a temporary problem that the community was able to handle, or was not a problem at all. All communities noted that they had illegal dumping before the program and they still have illegal dumping afterwards. If increased illegal dumping occurs, it can be reduced through a comprehensive public education campaign and an enforcement strategy with significant penalties.

Another concern is that charging directly for collection and disposal can pose a hardship for residents with low or fixed incomes. Unit pricing systems can be structured to provide assistance to residents with special financial needs. Communities can reduce the charges by a set amount or offer a percentage discount. In some cases, communities offer a certain number of free bags or stickers to low-income residents. Assistance can also be offered through existing low-income programs.

8-7-2 Current Status of Pay-As-You Throw Systems in Rhode Island

Six communities in Rhode Island currently have some type of pay-as-you-throw system in place for solid waste management. These include:

- Westerly/Hopkinton: Westerly started a pay-by-the-bag program in July 1994 contingent on approval of the voters in a November 1994 referendum. The referendum passed by a three-to-one margin. Residents are required to purchase special orange bags for trash disposal. Two sizes of bags are available: a 15-gallon bag for \$.66 or a 30-gallon bag for \$1.33. Town officials estimate that recycling increased by 13 percent and that solid waste decreased by 11 percent during the first six months of the program.
- Richmond: Residents' trash is weighed at the transfer station which is operated by a private contractor. The fee is based on a sliding scale from \$.07 per pound for amounts ranging up to 50 pounds to \$.415 per pound for amounts of 1000 pounds or more. Recyclables are accepted free of charge on a voluntary basis. In 1993, the Richmond recycling program, although voluntary, diverted 21.5 percent of solid waste from landfilling.
- New Shoreham: Residents are required to purchase coupons to affix to their own trash bags. Coupons are \$1.00 each. All bags must be 33 gallons or less and there is a limit of seven bags per trip to the transfer station. The operation of the transfer station was private as of June 1995. However, the town intends to assume this responsibility when the contract expires.
- South Kingstown/Narragansett: Residents are required to purchase special tags at \$1.00 each to deposit bags of trash up to 33 gallons at the transfer station. The towns also require residents to purchase yard waste bags at \$.75 each for composting. Recyclables include the six mandatory materials, old corrugated cardboard, yard waste, chipboard, textiles and food scraps. Recyclables are accepted at no charge. A private contractor operates the facility and is responsible for marketing recyclables. Food scraps are placed in 55-gallon drums and transported to a local pig farm. In October, November and December 1994, the towns diverted 33 percent of solid waste from landfilling. Additionally, the towns estimate that 8,400 pounds of food scraps and 7,000 pounds of textiles have been diverted from landfilling since August 1994.

Pawtucket and Barrington have conducted feasibility studies utilizing grants from DEM.

DEM, in conjunction with the Coalition of Northeastern Governors with funding from EPA, will conduct a pay-as-you-throw workshop for municipal officials in May 1995.

8-7-3 Findings

Pay-as-you-throw programs can reduce the amount of waste shipped to disposal facilities by 25 to 45 percent, resulting in lower waste disposal costs for municipalities.

Pay-as-you-throw programs can increase participation in recycling and composting programs and divert more waste.

Pay-as-you-throw systems support the legislatively mandated hierarchy of reduction and recycling over disposal.

Pay-as-you-throw programs provide a more equitable method to pay for waste disposal and allow residents more control over the amount of money they spend on waste management.

Approximately one-third of communities note temporary problems with illegal dumping as a result of implementing pay-as-you-throw programs.

Pay-as-you-throw programs can pose a hardship on residents with low- and fixed-incomes that can be alleviated by public subsidy.

8-7-4 Recommendations

- Each municipality should evaluate the feasibility of implementing a pay-as-you-throw system to pay for solid waste collection and disposal costs in order to maximize waste reduction and recycling.
- Pay-as-you-throw systems should be implemented in a manner that allows flexibility for municipalities to design systems to suit local circumstances.
- Pay-as-you-throw programs should include a comprehensive enforcement strategy with significant penalties to counter illegal dumping problems.
- Municipalities should include a mechanism to address the needs of residents with low and fixed incomes in the development of user-fee programs.
- DEM should continue to provide educational, technical and grant assistance to communities that choose to implement pay-as-you-throw systems.

APPENDIX A

STATEWIDE RESOURCE RECOVERY SYSTEM DEVELOPMENT PLAN

1. **AUTHORITY.** The Statewide Resource Recovery System Development Plan (SDP) is required by RIGL §23-19-11(1).
2. **PURPOSES.** The purposes of the SDP are:
 - a) to establish, for the purposes of planning by the Corporation:
 - 1) the annual per capita generation rates for municipal and commercial solid waste by the State and each of its municipalities;
 - 2) the baseline data for the generation of municipal and commercial solid waste in tons per year by the State and each of its municipalities;
 - 3) the official solid waste data base for the State and for the system operated by the RI Solid Waste Management Corporation (the Corporation);
 - 4) the data base which the Corporation will utilize to determine the wastesheds for each of its facilities, if appropriate;
 - 5) 20-year projections of the amounts of solid waste within the State and each of its municipalities that must be managed on an annual basis out to the 20-year planning horizon based on a range of standard variable factors, such as, population, employment, and waste generation change rates taking into account municipal and commercial recycling and source reduction rates;
 - 6) indicate the location, type and size of solid waste management facilities needed for the State's integrated solid waste management system, if appropriate and possible;
 - 7) ensure that all aspects of planning, zoning, population estimates, engineering, economics, need, service area, timing, geography, environmental and health issues are considered in planning programs or facilities;
 - 8) limit the use of landfills, maximize source reduction and recycling, include composting of yard waste and other organics and pursue the development of new uses for recovered recyclables to maximize revenue from recycled materials.
 - b) utilize the data base established by the Corporation and the methodology, as amended from time to time, outlined in Part 171-5, Projections of Waste Quantities, of the Rhode Island Comprehensive Solid Waste Management Plan (the Comprehensive Plan) to plan the appropriate size, number, type, mix, and location, if appropriate, of the facilities, systems, and programs for the management of solid waste in the State; and
 - c) assess annually the effectiveness of its facilities, systems and programs in tonnage removal and economic terms.
3. **SUPERSEDES.** This Appendix and the data, analyses, methodologies, findings, conclusions, facility and program discussions contained in the Comprehensive Plan supersede the June 1987 Statewide Resource Recovery System Development Plan, effective _____, 199____.
4. **REFERENCE DATA.**

SEE PARTS 171-3 THROUGH 171-8 OF THE COMPREHENSIVE PLAN.

5. SYSTEM, PROJECT AND PROGRAM ANALYSES.

SEE PARTS 171-5 THROUGH 171-8 OF THE COMPREHENSIVE PLAN.

6. FINDINGS/CONCLUSIONS.

SEE PARTS 171-1, 2, 6, 7 AND 8 OF THE COMPREHENSIVE PLAN.

7. FACILITY/PROGRAM TECHNICAL AND ECONOMIC DISCUSSIONS.

SEE PARTS 171-6, 7 AND 8 OF THE COMPREHENSIVE PLAN.

8. EFFECTIVE DATE. _____